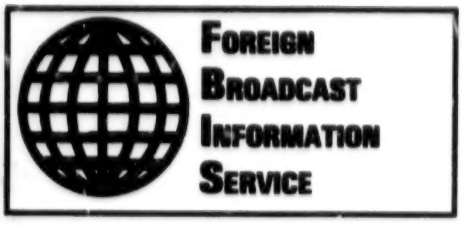
JPRS-TND-90-003
1 FEBRUARY 1990



JPRS Report

Nuclear Developments

Nuclear Developments

JPRS-TND-90-003 *1 FEBRUARY 1990*

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Official on Qinshan Nuclear Plant

HK1412091289 Hong kong WEN WEI PO in Chinese 30 Nov 89 p 3

["Special Interview" by Xu Wenbing (1776 2429 3521) and He Ping (6320 1627): "Road to Building Qinshan Nuclear Power Station—Interview with Yang Zhongwan (2799 1813 8001), Director of Shanghai Municipal Nuclear Power Office"—datelined Shanghai 27 November]

[Text] The 300,000kw Qinshan Nuclear Power Station, the first nuclear power station designed and built entirely by China, will be completely fitted out before the end of this year. It will begin trial operation early next year and will start generating by the end of 1990. To find out more, we paid a special visit to Mr Yang Zhongwan, Director of the Shanghai Municipal Nuclear Power Office.

Progress Is Not Slow Despite the Late Start

According to Mr Yang, construction of China's first 300,000kw nuclear power station at Qinshan began on 1 April 1985, when the first concrete pile was cast; the station is scheduled to be completed and begin generating by December 1990. The speed of construction—69 months from start to finish—is comparable with the time taken to build similar nuclear power plants in other parts of the world.

Mr Yang then pulled out a data file from his drawer and cited the following examples to us: From the time the first pressurized reactor station was built in the United States in 1957, a total of 428 nuclear power stations have already been built and put into operation. Take France, which has built the greatest number of nuclear power stations and seen the fastest development of nuclear power production, for instance. Between 1985 and 1986, 10 stations, each with an installed capacity of 900,000kw, were built and put into operation. On average each station only took 70 months to build. During the same period, 8 nuclear power stations were built in the United States, each taking 130 months on the average, while 6 were built in the Soviet Union, each taking an average of 102 months.

Compared with international practice, although China is 30 years behind in building its first 300,000kw nuclear power station, the actual speed of construction of the Qinshan station is by no means slow, and is in fact basically quite close to international standards. The State Council department concerned even predicted that if a second nuclear power station were to be built at Qinshan, construction would only take a little over 60 months.

Quality Confirmed by Two Inspections

The Qinshan 300,000kw nuclear power station has undergone two stringent inspections during its construction.

In 1987, when civil engineering work at Qinshan entered its crucial stage and a large quantity of mechanical equipment manufactured by various departments and units was successfully being assembled, the State Council commissioned the Leading Group for Major Technical Equipment and Projects to organize renowned architectural and welding experts from Chinese universities and research institutes to conduct overall inspections at the Qinshan work site, and at the various processing enterprises in Shanghai. The team confirmed the quality of the entire project and pointed out that all items were up to the standards stipulated by the State.

Last March, the State Nuclear Safety Bureau, the Ministry of Nuclear Industry and other units invited the International Atomic Energy Agency (IAEA) to conduct another overall quality appraisal of the Qinshan site. After 3 weeks of detailed and thorough inspection, from the construction of the outer shell of the nuclear and conventional islands to the installation of reactor components, evaporators and turbogenerators, it was unanimously agreed that the quality of work was impeccable and in total accord with the various specifications of IAEA. Some nuclear experts said they had faith in the quality of this station and believed its safety standards to be dependable.

It is understood that products produced by the Shanghai No. 1 Lathe Factory, the Shanghai Boiler Plant, the Shanghai Turbogenerator Plant, the Shanghai Power Station Auxiliary Machine Plant and other units which are responsible for supplying key equipment like reactor components, evaporators and turbogenerators to the Qinshan base have all passed the relevant state acceptance tests. In addition, the close to 3,000 units of valve produced by the Shanghai Valve Plant, Lianggong Valve Plant and other enterprises have also passed ministerial-level acceptance tests, indicating that all products have attained an excellent level in terms of quality.

Bright Prospects for the Development of Nuclear Power Stations

According to Mr Yang, the first Qinshan 300,000kw nuclear power station built entirely by China will have a great impact on the world and on a number of Southeast Asian countries in particular. During his recent visit to Pakistan, Premier Li Peng agreed to export a 300,000kw nuclear power generating unit to that country.

Relevant departments of Shanghai Municipality are considering raising local funds through various channels and seeking loans from the state to build two more 300,000kw nuclear power generating units in Shanghai. In addition, Shanghai is also actively creating the necessary conditions for the trial-manufacture of two 600,000kw nuclear power generating units while ensuring the fulfillment of key scientific research projects. It is believed that in the not-too-long future Shanghai will become an important nuclear equipment manufacturing base in China.

Nuclear Industry Develops Steadily

OW2612074889 Beijing XINHUA Domestic Service in Chinese 0616 GMT 24 Dec 89

[By reporter Hu Nianqiu (5170 1628 4428)]

[Text] Beijing, 24 Dec (XINHUA)—Production and economic returns in the nuclear industry have steadily increased this year. By the end of November, the production of nuclear products for military and civilian use had fulfilled their plans a month ahead of time, and the total amount of profits had also risen.

According to the China General Nuclear Industrial Company, the output value of nuclear-industrial products for civilian use accounts for more than 40 percent of the total output value of nuclear-industrial products, and the profits of the products for civilian use have increased 25 percent over last year. Foreign trade and export of labor services have developed considerably. Seven of 11 new lines to produce goods for civilian use have been completed, checked, and accepted. A number of regular-energy projects have been developed, and a rare-earth project with an investment of more than 50 million yuan has been built. When all these projects are completed, nuclear industry will have certain favorable conditions in some civilian industries and fields.

A number of products with high technological standards and good economic results have been developed on the basis of strengthened scientific research and close lateral ties between designing units and enterprises. After passing appraisals, 35 new products, including an atomic microreactor, an electromagnetic isotope separator, a product made by using radiant heat generated by an electron accelerator [dian zi jia su qi fu zhao re gu suo zhi pin 7193 1311 0502 6643 0892 6553 3564 3583 0942 4799 0455 0756], and special circuit equipment for printing which are very useful in various sectors of the national economy, are put into production.

Key projects in nuclear industry, especially in the building of nuclear power plants, are making good progress. Now 80 percent of the investment in the first-stage project of the Qinshan Nuclear Power Plant has been fulfilled. Most sets of nuclear-island [he dao 2702 1497] and regular-island [chang gui dao 1603 6016 1497] equipment have been put in place, and the welding of the main pipes has been completed. And the installation of auxiliary systems are drawing to an end, and preparations are being made for an all-round trial run. The designing work for the second-stage project of the nuclear power plant is in full swing. On the site of the Dayawan Nuclear Power Plant, 65 percent of the construction project for its No. 1 generating unit has been completed; the dome for its No. 1 reactor plant has been successfully installed. And the whole project is now in the stage of installation.

Report on Nuclear Energy Development

HK0401144990 Beijing ZHONGGUO XINWEN SHE in Chinese 0920 GMT 2 Jan 90

[Report: "Great Development Is in Store for China's Tapping of Nuclear Energy—ZHONGGUO XINWEN SHE headline]

[Text] Beijing, 2 Jan (ZHONGGUO XINWEN SHE)—Member of the Scientific Council of the Academy of Sciences of China Wang Ganchang, a well-known nuclear physicist, said in forecasting 1990's development that China's tapping and exploitation of nuclear energy will see great development in the coming decade.

An article written by Wang Ganchang, carried in today's GUANGMING RIBAO, reveals that the 300,000-kw Taishan Nuclear Power Plant, built independently by China, will see the completion of a major loop system and the experiment of systematic pressing [da ya 2092 1090] this March; August will see the installation of nuclear fuel, early November will see criticality and in December power [gong lu 0501 3764] will be raised for combined-grid [bing wang 1629 4986] power generation.

The No 1 and No 2 reactors, both with an installed capacity of 900,000 kw, at the Daya Bay Nuclear Power Plant in Guangdong will both enter a busy installation period, and will be filled with nuclear fuel in 1992 and 1993 for combined-grid power generation.

At the start of the 1990's, general design and relevant scientific research on two 600,000-kw nuclear power plants will begin, representing the second phase of Taishan nuclear construction which features independent efforts supplemented by Sino-foreign cooperation. The design and research work is expected to be completed in the middle to late 1990's. Meanwhile, the design and construction of another Taishan 300,000-kw nuclear power plant, which is the first one built with local funds, will also begin.

Wang Ganchang has also revealed that China will continue to purchase foreign nuclear power plant facilities for the construction of the Liaoning Nuclear Power Plant. At the same time China-made nuclear power plant facilities will enter the international market.

Wang Ganchang also says it is possible that breakthroughs and practical application will be achieved in the early 21st century in the research on thermonuclear fusion, which will take seawater as the raw material and will have tremendous energy. At present thermonuclear fusion research under controlled conditions has been listed as a key long-range state project. It is expected that China will achieve great progress in the tapping and application of reactors and nuclear technology in the 1990's: China will see the use of advanced international-level pulse reactors and low-power reactors and their entry in the international market. Important progress will also be made in the purification of foul water with nuclear technology.

Wang Ganchang also says the uranium of the discovered mines with medium-range uranium is of very high quality, and its tapping will provide important impetus for the development of China's nuclear technology.

BULGARIA

Ecoglasnost Protests Belene Nuclear Plant

AU2401194990 Sofia BTA in English 1848 GMT 24 Jan 90

[Text] Sofia, January 24 (BTA)—A petition with another 30,000 signatures against the construction of the Belene Nuclear Power Plant were presented to the National Assembly by representatives of the Ecoglasnost Independent Association from all over the country.

At the rally before the Parliament several speakers pointed out that the construction was started without consulting the population and in contravention to the ecological findings of the Bulgarian Academy of Sciences.

An opinion was expressed that the construction of the nuclear plant is an offence against the law and that the over-1000 megawatt nuclear reactors are insufficiently reliable.

In its petition Ecoglasnost insists on discontinuing the construction of the Belene nuclear plant, making public the data about the background radiation, on the National Assembly's passing of a protection and regeneration of the environment bill, etc.

Normal Work Resumes at Kozloduy Nuclear Plant

AU2401110690 Sofia Domestic Service in Bulgarian 1000 GMT 24 Jan 90

[Text] Work has resumed at Generating Unit No. 5 of the Kozloduy Nuclear Plant. Last night it was activated and joined the country's power supply system. At 1000 hours [0800 GMT], the unit reached 80-percent of its 1,000-megawatt reactor capacity.

CZECHOSLOVAKIA

Western Design Planned for New Temelin Units

AU1701085790 Prague MLADA FRONTA in Czech 9 Jan 90 p 1

[Zdenek John report: "Sixty Plus One"]

[Excerpts] The yellow-and-black stickers distributed by the Austrian branch of Greenpeace have really set afire the faintly glowing distrust of nuclear power stations in Czechoslovakia. Naturally, the "fire" has provoked the appropriate reaction. Officials from the Czech Energy Power Plants enterprise and from the Federal Ministry of Fuels and Power are beginning to put it out. [passage omitted]

A booklet is to be published in late February that should answer the most burning issues. There will be 60 of them, among them the problems of storing spent nuclear fuel, the monitoring system around the existing nuclear power stations, and the impact of these installations on the atmosphere, water, and soil, and others. At yesterday's news conference in the building of the Federal Ministry of Fuels and Power in Prague, Engineer Dalibor Mateju from the Czech Energy Power Plants enterprise revealed that, apart from the issuance of the publication, the manner of informing the public about the situation concerning nuclear power will also change. According to a French model, a scale is being worked on, in which every breakdown or accident in a power station will receive a grade. On this basis even a layman will easily recognize how serious a potential incident is. [passage omitted]

"So far we have not managed to declassify the external emergency plan. Right now we are working on it together with the Civil Defense," Engineer Mateju said. Let us add that the external emergency plan sets out how everyone should behave in the event of an accident in a nuclear installation. Only the person who has enforced this absurd stipulation probably knows why it has been kept secret so far.

The Temelin nuclear power station attracts the greatest attention at present. [passage omitted]

Engineer Mateju: "We will subject the first two units to a follow-up expert inquiry, which will show their effect. In my opinion, the third and fourth units will be constructed on the basis of West European design, if not completely according to it. However, nothing has been made official so far. I believe that we definitely will have to build the third and fourth units. Consumption of electricity will force us to do so." Let us call to mind the fact that [a nuclear power station built according to] the West European design is up to three times cheaper than the Soviet design used in Czechoslovakia thus far. On the other hand, it must be paid for in hard currency. [passage omitted]

Nuclear Plant Construction To Be Reduced

AU1601195490 Vienna Television Service in German 1830 GMT 16 Jan 90

[Report by Joana Radzyner]

[Text] The CSSR Government has decided to partially stop the construction of the Temelin nuclear power plant in southern Bohemia. This means that the construction of two reactor blocks will be stopped. Valtr Komarek, vice president of the CSSR and leading economic expert, commented on his government's decision during a meeting with Chancellor Vranitzky today.

It is too late to shift to the use of other energy sources, Valtr Komarek pointed out. The halt in the construction of two reactor blocks in Temelin and the safety examination and the technical improvement of the two other blocks that have already been completed are currently the only viable ways toward minimizing the damage. Personally, he is not happy about this compromise, the former head of the institute of the CSSR Academy of Sciences responsible for forecasts added. As early as in

1983, this institute warned against pushing ahead with the use of nuclear energy, using arguments concerning the safety of nuclear power plants and economic arguments.

Chancellor Vranitzky was not happy about the Temelin decision either.

[Begin Vranitzky recording] Well, one can say that a glass is half filled with water or half empty. However, despite the fact that we are not absolutely satisfied, we feel initial satisfaction that an important step has been taken, which was not possible in the past. [end recording]

Conference on Handling Nuclear Waste Reported

AU2001144590 Bratislava PRAVDA in Slovak 18 Jan 90 p 2

[Unattributed CTK report: "Nuclear Power Plants Today and Tomorrow"]

[Text] Jaslovske Bohunice—During operation of the Jaslovske Bohunice nuclear power plant, no radioactive waste was transported to dumps outside its area. The risk of such materials finding their way into the power plant's communal waste system has been discounted since each transport is specially controlled by dosimetric devices, said Jozef Hutta, head of the nuclear safety section at the Jaslovske Bohunice nuclear power plant, at a meeting with journalists yesterday. An inseparable part of the power plant's operation is its radiation control and, in particular, evaluation of the plant's influence on the surrounding environment. A set of figures is collected every day and compared to valid limits. For example, last year, on the basis of this monitoring, it was ascertained that the amount of radioactive materials released into the atmosphere by the power plant did not exceed the designated limits. A minor breach took place on two occasions involving emissions into the hydrosphere. These were emissions of water from A 1-type nuclear power plants which overall represented approximately 12 percent of the annually permitted limit.

GERMAN DEMOCRATIC REPUBLIC

Nuclear Safety Agreement Reached With FRG

LD1701194190 East Berlin ADN International Service in German 1611 GMT 17 Jan 90

[Text] Berlin (ADN)—The GDR and the FRG are to set up a joint commission for the safety of nuclear technology installations. Proceeding from internationally recognized safety requirements, it is to define cooperation between the two German states and deploy working groups for the main target areas. This was stated by Professor Dr. Klaus Toepfer, federal minister of the environment, nature protection and reactor safety, today at a news conference in Berlin.

Cooperation in safety inspections of the Greifswald nuclear power station (Rostock area) is to start within a short time. The two sides are also to cooperate in the expansion of the Greifswald nuclear power station and the building of the Stendal nuclear power station (Magdeburg area), Toepfer said, referring to the talks he had today in Berlin with State Secretary Prof. Dr. Georg Sitzlack, president of the State Office for Nuclear Safety and Radiation Protection, and Heavy Industry Minister Dr. Kurt Singhuber.

Prof. Sitzlack assessed his talk with the federal minister as extaordinarily productive. The existing good cooperation would receive a "powerful impetus." Like Toepfer, he described it as necessary to unify the licensing procedures and regulations in the two countries. The aim is not to propagate nuclear energy at any cost. However, it is an indispensible source of energy for the GDR that must be used in such a way that it poses no dangers to man and nature.

In the GDR, 23,000 people had been trained in this sphere. So far no situation has arisen that has not been mastered. But advancing technology provides increasing possibilities for safety guarantees and it is a good thing to be able to jointly use the FRG's capacities and power in this sector.

Minister Toepfer also briefly reported about a talk with representatives of the opposition parties participating in the roundtable. Here the question has arisen as to how meaningful decisions on nuclear technology can be made as long as no energy concept has been drafted by the GDR. On the other hand, they have agreed that a renunciation of lignite is necessary. The opposition representatives have also raised the problem of excessively low energy prices and wasted energy in the GDR.

Toepfer said that a further talk during his visit to the GDR, which started Tuesday and is to end tomorrow with a visit to the Greifswald nuclear power station, was held with Environment Minister Dr Peter Diederich. Two agreements have been signed. One refers to the construction of a smog early warning system, for which stationary measuring stations are to be set up in Schwerin, Gardelegen, Harzgerode, Erfurt, Schleiz, Wiesenburg, Lindenberg, Leipzig and Doberlog. There will also be a measuring vehicle for flexible data transmission in various locations. The Federal Environment Ministry is making available DM 7 million for the order, which will be given to a medium-sized enterprise. The GDR, for its part, is providing services to the tune of M 1.1 million and will bear the running costs of M 410,000 annually. The measuring technology will be effective at the end of August at the latest.

A joint statement on the establishment of five water-quality measuring stations was also signed, said Toepfer. They are to be set up on the Elbe river in Schmilka, Zehren and Magdeburg, on the Havel river in Potsdam and on the Spree in Berlin. The FRG will finance the project to the tune of DM 6.25 million, while the costs for the GDR will amount to about M 3.5 million.

During the talk with his counterpart, foundations for a joint environmental commission were also laid.

Further on Nuclear Safety Pact With FRG

LD1701235190 East Berlin ADN International Service in German 1652 GMT 17 Jan 90

[Text] Berlin (ADN)—At the invitation of State Secretary Professor Sitzlack, president of the State Office for Nuclear Safety and Radiation Protection, Federal Environmental Minister Professor Toepfer visited the GDR from 16 to 18 [as received] January. He visited the final storage site for radioactive waste at Morsleben, the construction site of the Stendal nuclear power station and the "Bruno Leuschner" nuclear power station at Greifswald. During the visit, there were talks about the standard of safety of nuclear technology, of radiation protection and of nuclear waste disposal with the present level of peaceful use of nuclear energy in the FRG and the GDR, and about intensification of cooperation in these spheres. Necessary and possible precautionary measures against damage and for the further development of radiation protection and the safety of nuclear technology were discussed.

The visit had been agreed to earlier for the implementation of the Radiation Protection Accord of 8 September 1987. The talks were devoted particularly to putting into practice the "Joint Statement" by Federal Chancellor Kohl and Prime Minister Modrow on 19 December 1989, which said that "both sides are continuing to implement the Radiation Protection Accord of 8 September 1989 [as received] by expanding cooperation in the safety of nuclear technology within the framework of the peaceful use of nuclear energy and in radiation protection in the spirit of a deeper safety partnership. For this purpose a joint concept should be developed at an early date."

Basic Outlines of the Concept

Both sides agree that common security interests must be further developed into a conscious and desired security partnership with the preservation of each side's responsibility. The goal is the development of a joint security culture on the basis of the traditions of science and technology and technical supervision that have grown up.

This development of a security partnership is embedded in the process of stepped-up international cooperation in the framework of the International Atomic Energy Agency (IAEA) and within Europe. The concept will be progressively expanded in accordance with further progress in the creation of a treaty-based community.

The points of departure are the internationally elaborated and recognized safety standards of the IAEA. On this basis, and in view of the legal regulations that go beyond this and the respective official and technical safety practice in the FRG and the GDR, there should be cooperation at the highest possible level with the aim of harmonization. This cooperation should be consistent with developments in other states making use of nuclear energy and with developments resulting from European integration.

In the forefront of cooperation is the setting of current technical safety tasks and monitoring of the present use of nuclear energy.

Cooperation is to take place with regard to separation of the state offices that are responsible for checking protection against the dangers resulting from use of nuclear energy from the offices that, as operators of the nuclear plants, are responsible for ensuring safety, for economic utilization and for the promotion of nuclear energy. Cooperation thus takes place in the first instance between the authorities of both states responsible for the safety of nuclear technology and for radiation protection and between the experts they call in.

Starting from previous experience and the progressive international developments that are becoming apparent, methods and procedures in the examination and overall assessment of the security of nuclear plant are to be developed and put into practice.

Close cooperation with regard to safety checks in nuclear power stations already in operation is to be instituted as an immediate measure. The federal minister for environment, nature protection and reactor safety will participate in a relevant program of work of the responsible GDR offices for checking the state of safety and the need for, and possibilities of, technical and operational improvements in the safety of first-generation nuclear power stations in the GDR. Here it is a question of whether, and if so how, these nuclear power stations can be brought up to modern safety standards.

Close cooperation is also intended in the investigation of, and checking for the security of, nuclear power stations that are being test run or in the process of construction.

Technical cooperation in special areas with regard to current and new questions of technical safety that have arisen from the operating of nuclear power stations will be further expanded. To this end, joint checks and working meetings should be conducted. Joint procedures will be developed for recording and evaluating special incidents in nuclear power stations and for applying the knowledge gained from this. Joint programs will be undertaken in the sphere of training and further training, theoretical instruction and simulator training.

Cooperation in the Field of Radiation Protection

Both sides are aiming to ensure the protection at a uniform level of the population, people who are professionally exposed to radiation and the environment from radiation danger.

In international bodies that deal with current questions of radiation protection, there should be coordination between the delegations of the two countries.

Radiation protection concepts and limits are to be discussed and further developed with the aim of standardizing them. This applies particularly to emergency protection measures.

Studies on the evaluation of radiation protection are to be worked out together, reciprocally augmented and jointly evaluated.

Basic principles for the discharging of radioactive materials into rivers that cross borders, such as the Elbe, Havel or Spree, and for coordinated checking programs with the aim of unified monitoring of the environs of the nuclear power stations are to be worked out.

The existing or planned measuring networks for monitoring environmental radioactivity and for monitoring the environs of the nuclear power stations are to be expanded, with consideration of common interests, placed on a basis for comparable evaluation and linked together.

Cooperation in the Sphere of Disposal

For both sides, the safe disposal of radioactive waste is a condition for the peaceful use of nuclear energy.

With the aim of setting their requirements at a high level of technical safety and of coordinating them, both sides will cooperate closely in the areas of final storage, conditioning, and, in particular, the final storage of radioactive waste, and exchange relevant information, for example, about the geology on both sides of the border.

The envisioned cooperation also includes an exchange of experience gained in operating the final storage of radioactive waste—at the Asse experimental final storage site in the FRG and at the Morsleben final storage site in the GDR—and of methods and results of safety analysis and also of the results of the current monitoring of final storage sites.

Both sides hold the view that the taking over of radioactive waste for the purpose of its final storage does not come into question.

Cooperation in the Field of Nuclear Law

Taking international and European developments into consideration, stock will be taken of the currently valid legal regulations in the two countries. The individual regulations will be compared with one another for the purpose of harmonization.

In view of planned nuclear technical installations near the border of the other German state, both sides attach special importance to possibilities for information for their citizens and for their involvement. For this the responsible offices of the FRG and the GDR will soon be starting talks on the basis of the bilateral agreement on exchange of information and experience in the sphere of radiation protection of 8 September 1987. Here, practical aspects of procedures are to be dealt with first.

Furthermore, both sides are in favor of discussing mutually interesting questions of nuclear law more intensively within the framework of joint conferences on jurisprudence and international symposia.

Cooperation in Organization and Procedures

A joint commission of the authorities responsible for the safety of nuclear plant and for radiation protection will be formed, with appropriate working groups. For its first task, this commission is to specify the basic concepts and develop them further. Its task also consists in supervising the agreed-upon immediate measures.

In the interests of a deeper understanding of present official and technical safety practice, there will be an exchange of personnel between authorities and experts' organizations of the two states.

There is also agreement that the Commission for Reactor Safety and the Commission for Radiation Protection at the Federal Ministry for the Environment, Nature Protection and Reactor Safety will also invite the appropriate GDR offices where the topics are relevant to the GDR. The GDR will act in the same way.

Both sides agreed that this cooperation must be incorporated into an overall ecological and technical safety concept in the interests of safe and future-orientated energy supplies for Europe.

HUNGARY

French Offer To Expand Nuclear Plant

25000566Z Budapest FIGYELO in Hungarian 21 Dec 89 p 9

[Text] As reported in daily newspapers, a statement of intent has been issued by the Paks Nuclear Power Plant Enterprise and the French EDF (Electricite de France Internationale) firm regarding the construction of two new 1,000-megawatt nuclear power plant blocs in the framework of a joint enterprise. According to the offer, the French firm would pay for 70 percent of the construction costs in foreign exchange, and 30 percent would be paid by the Hungarian party in forints. The $2 billion French investment would be repaid by the Hungarian enterprise in the form of electricity over a 20-year period, beginning upon completion of the construction in 1997 or 1998.

The offer appears to be favorable, because one of the new blocs would be linked to the West European energy system. This would change the one-sided dependence and would render Hungary's electrical supply more secure. The French partner would construct the power lines from the West to the Hungarian-Austrian border,

and would supply the power plant's heating elements and haul away the spent elements.

All of this means that the people in Paks succeeded with their lobbying effort to expand the power plant as soon as possible. Or did they? The "lignite lobby" within Parliament's Electrical Energy Section instantly launched a counterattack. In other words, the debate has been rekindled. All of this goes to show that once again the perceived energetics concerns of various interest groups and most certainly some real existential interests are about to clash. All of this is in the absence of a thorough comparison and evaluation by the trade of some half dozen offers for the construction of basic power plants, according to the state secretary.

ROMANIA

Ryzhkov Denies Soviet Troops Protected Reactor

LD1101221490 Belgrade TANJUG in English 1342 GMT 11 Jan 90

[Text] Moscow, Jan 11 (TANJUG)—The Soviet Union did not send troops to protect the Romanian nuclear power plant from being blown up by terrorists supporting deposed dictator Nicolae Ceausescu, Soviet Premier Nikolay Ryzhkov said here Thursday.

Ryzhkov said that Romania had not asked for Soviet help in protecting the nuclear plant and that the Soviet Union had no intention of doing so.

Cernavoda Nuclear Power Plant Under Construction

AU1901193590 Bucharest ROMPRES in English 1733 GMT 19 Jan 90

["Stage of Construction Works on the Nuclear Power Plant at Cernavoda"—ROMPRES headline]

[Text] Bucharest—John P. Karger, coordinating manager for the construction of the nuclear power plant on behalf of the Canadian state, said that roughly 98-99 percent of the Canadian furnishings and some 80-85 percent of the Romanian ones had been put on stream to help start the operation of the generator set No. 1. Similar figures are registered in the case of the second generator set. Therefore, there is no longer a matter of equipment and materials; the only question is to amend the quality of some of them, something which is easily attainable. A strict labour organization is equally important. Equipment should be taken out from the places where they had been stored. Canadian experts are still available and imports will probably be needed.

Mr Karger's belief is that the first generator set could become operational in three or in three and a half years. In his opinion, the generator sets No. 3, 4 and 5 should not be abandoned as many Romanian factories have already got specialized in the manufacture of nuclear equipment—an experience that was not easily acquired and which should be furthered and improved.

Olariu Assesses Cernavoda Nuclear Plant Project

AU2301075990 Bucharest ROMPRES in English 0721 GMT 23 Jan 90

["CAE Cernavoda—A Fundamental Overhaul"—ROMPRES headline]

[Text] Bucharest, ROMPRES, 23/1/1990—Stefan Alexandru Olariu, chairman of the Nuclear Activity Control Commission, set up on 8 January under a decree of the National Salvation Front Council, assesses that the project of the nuclear power plant at Cernavoda, now under construction, must be revised and work resumed on different bases. Everthing must be verified, he said, specifying that in a few days the Nuclear Activity Control Commission will propose the cessation of works. As a matter of fact, activity has stopped at Cernavoda since 22 December 1989.

ARGENTINA

Nuclear Plan Stagnation Assessed

90WP0026A Buenos Aires SOMOS in Spanish
20 Dec 89 pp 65-66

[Report by Daniel Arias, science and technology reporter]

[Text] SOMOS has asked me to assess Argentine research during the past decade. I am doing so as a science reporter, and I must say that I find it in very bad shape. It could have recovered and perhaps still can, but the prognosis is guarded.

The clinical history is to be found in the headlines. In the 1970's a native Argentine (Mr Luis Leloir) was able to win a Nobel Prize inside his country. In 1984, another did, but this time he lived outside the country (Cesar Milstein). And the light is going out because the Nuclear Plan is at a standstill.

Although this is a country of biologists (three Nobel Prize winners in the field proclaim this truth), 10 years ago it seemed as though the brightest future for Argentine research lay in the nuclear area, because the National Atomic Energy Commission (CNEA) was putting together a chain of knowledge (one of a kind in the country) that began in the laboratory and ended in the marketplace.

Building infrastructure, selling electricity, radioisotopes, and technological know-how, setting up new private industries and introducing modern technology into existing ones, and invading markets exclusive to our creditors, with its own technology the CNEA at the start of the decade was like the one-eyed man in the country of the blind.

In 1983 the Economy Ministry resolved the contradiction by leaving it without a peso and with all of its projects half-completed. By mid-1987 a nuclear worker's pay was down 71 percent from early 1984, and one scientist was leaving home every 3 days. Atucha II remained under construction forever; Embalse and Atucha I were without spare parts. The country was in the midst of an energy crisis. All subsequent finance ministers have continued the "atomic belt-tightening," which many have said just involved settling old scores, without really caring whether the lights get turned on or off. And this is still happening.

The 1976 coup aggravated two endemic diseases of Argentine research and created a third: plundering. The same old woes (the export of highly trained people, the lack of money) became staggering. Before 1976 only personnel from the most dynamic sector were being lost, researchers from 30 to 45 years of age, the indispensable ones, the ones who give the old boys a push and drag along the young. By the end of the decade, time was taking care of yesterday's big guns (Mr Luis Leloir, Mr Jorge Sabato), while the intermediate generation that stayed here was earning between $100 and $150 a month, and recent graduates found that their only chance was Ezeiza, but right away, without wasting a minute.

The very young are refusing to join the poorest 15 percent of the Argentine population to which older scientists already belong. Some 70 percent of the 1982 graduating class in physics has emigrated. There were fewer travelers among the 1977 class of biochemists, as only two-thirds left. This year registrations were down 50 percent in the CNEA's nuclear majors (physics and engineering). The news of scientists' poverty has already gotten back to secondary schools.

1976 also brought the sordid novelty of theft. Conicet [National Council for Scientific and Technological Research] debuted during this decade, full of phantom institutes, official stamps made by "someone's friend," one telephone, a plaque, and a fat appropriation in the budget. But a country that spends only 0.4 percent of its GDP [gross domestic product] on science and research (compared to our creditors' 3 percent) cannot afford the theft of so many test-tubes—especially when the annual equipment subsidy that gets to this or that group of serious biologists (let's say a group of five researchers of the kind who really do work) covers the cost of 5 days worth of experiments.

The Radical Party administration ended the witch-hunt and investigated and closed several of these pirate centers. It thus cut short the metastasis but did not destroy the cancer because it did not democratize the selection of authorities at research centers. A hand-picked bureaucrat, no matter what his political origin, turns into a crook as soon as the censorship—or lack of interest—of the media gives him carte blanche.

The experience all over the world is that, in contrast, science flourishes not only when duly funded but also when there is ample opportunity to complain without suffering reprisals. This is still not the case, period. And so our science grows mediocre, because there is nothing like a nag to prevent the true thoroughbreds from emerging from the herd. And along this path of natural selection in reverse we have soon faded from the eccentric brilliance and seriousness of our three Nobel Prize winners to the depressing fraud of crotoxina [variety of snake poison that was touted as a cancer cure], which not only does not cure cancer but also kills the patient prematurely because it accelerates the growth of his tumors and causes hemorrhaging. Here is a possible headline for the decade: "Crotoscience is Here."

The Radicals wore themselves out trying to get Argentine industry and researchers to sign risk contracts. The idea was to make money and bring modern technology into the economy: less pure science, more applied science, and to the extent possible, a great deal of specific, salable technology. And patents, and money for the professionals. But the country went astray, with the help of an aforementioned ministry.

Just in case, stupendous terms were offered to industrialists, in the form of tax breaks. Even if patents that had a major impact on the market were obtained, almost the only thing that the State accomplished was to keep researchers in the country. In any case, just 120 contracts were signed, and a much smaller number was actually executed, as businessmen deserted. Money-exchange offices attract more dollars than do laboratories. And unfortunately, the number of domestic industries with their own research capabilities can be counted on the fingers of one hand, with a few left over.

The best results of the 1980's in science are to be found in bilateral business with Brazil. From 1985 to 1988 there were major initiatives for joint efforts in biotechnology and computers. But the "star" was the nuclear area. Specifically, the country succeeded in establishing a nearly $30-million-a-year market for the exchange of nuclear technology with Brazil, in which private companies from the two nations are operating. Furthermore, even in the midst of its terrible crisis, the Nuclear Plan exported at least $150 million in Argentine "gear" to Peru and Algeria.

One thing is quite clear as we near the 1990's: The awful truth is that the customary progressive speeches of almost all homegrown leaders (whether they wear brown boots, white berets, or derby hats and ties) conceal the deep-seated conviction that science is window dressing, an expensive little luxury for some crazy aristocrats to engage in during fat times. There are no real incentives to export, and the domestic market will accept any old chintzy item, so there is no need to modernize or improve production. When things are viewed thus, the only problem with the departure of scientists is that they should leave faster and stop pestering us with their complaints.

Because it seems as though for once they will make themselves heard. The Forum of Argentine Science Associations has just been set up; it consists of 33 associations representing some 15,000 scientists and has as yet unknown lobbying strength. Perhaps the bottom line on science during the coming decade will be something like "if he's still fighting, he's not dead."

Atucha I Nuclear Plant Reopens After 16 Months

PY1101012090 Buenos Aires TELAM in Spanish 2251 GMT 10 Jan 90

[Text] Buenos Aires, 10 Jan (TELAM)—Energy Secretary Julio Cesar Araoz has officially reported that the Atucha I nuclear power plant resumed operations after being closed for 16 months due to a technical failure. Araoz said that the plant began operations at 30 percent of its 340-megawatt capacity.

Through a communique issued by the secretariat, Araoz conveyed President Carlos Menem's congratulations to the personnel and authorities of the National Atomic Energy Commission [CNEA] for "the complex work done" to repair the reactor.

Atucha I, the first Argentine nuclear power plant, discontinued operations on 11 August 1988 after a cooling channel in the reactor broke without causing any sort of radioactivity problem. The equipment was repaired by the CNEA, which designed its own technology for this purpose. The plant, which was dedicated in March 1974, is located on the Parana de las Palmas River near Zarate, 100 km northeast of Buenos Aires.

The communique states that on 8 January, with the repair work finished and checked, the reactor was put into critical condition; that is, the chain reaction to maintain the fission process was begun.

The communique states that "at 0116 on 8 January, a 0-power testing program was initiated with a gradual increase in power." "On 9 January," the communique adds, "after a series of tests performed by a team of CNEA specialists, the reactor's power was increased to 30 percent."

TELAM learned from the office of CNEA President Manuel Mondino that the Atucha I plant is waiting out a request to once again join the national interconnected power network (SIN), a measure that might be under implementation at this time.

Araoz said that the resumption of operations at Atucha I marks the end of "a long period of highly complex work by Argentine technicians, professionals, and workers." He noted that the problem that was affecting the equipment at Atucha I "was an unprecedented technical failure that tested the capacity and creativity of our nuclear sector's human resources."

The secretary noted that the operation of the plant "will be key in guaranteeing the supply" of electricity. Araoz added that "the worst part of the power shortage is over," alluding to the seasonal power consumption increase in December. He warned, however, that "the crisis will be with us for some time, and it is essential that we Argentines reformulate our [word indistinct] of electricity consumption.

CNEA To Be Subordinate to Presidency Again

PY1601161890 Buenos Aires LA PRENSA in Spanish 13 Jan 90 p 3

[Excerpts] Lima (Argentina)—President Carlos Menem announced here yesterday that the CNEA (National Atomic Energy Commission) "will be subordinated to the Presidency again," because that is "its natural environment."

President Menem made the announcement during a visit yesterday afternoon to Atucha I nuclear plant. The plant very recently resumed operations after being closed down for several months.

The president congratulated the Argentine scientists, technicians, and workers who made it possible to bring Atucha I back into operation after being closed since

August 1989 following the discovery of serious flaws in the reactor pipe system. [passage omitted]

Menem recalled that it was first considered necessary to contract German technicians to repair the nuclear plant but, in view of budgetary and economic difficulties, "it was decided to rely on the recognized capability of Argentine scientists, technicians, and workers." [passage omitted]

BRAZIL

IPEN To Get Aramar Enriched Uranium in June

90WP0032A Sao Paulo GAZETA MERCANTIL in Portuguese 1 Dec 89 p 14

[Report by Ipero correspondent Amarilis Bertachini]

[Text] The Aramar Experimental Center in the Sao Paulo city of Ipero will start supplying the Institute for Nuclear and Energy Research (IPEN) with 20-percent enriched uranium in June. The fuel will be used in a reactor that has been set up at the University of Sao Paulo (USP) to produce radioisotopes (radioactive elements) and radioactive pharmaceuticals for medicinal uses—the only reactor of its kind in Brazil.

Delivery of the uranium to IPEN was scheduled to be made by the end of this year but, according to Rear Admiral Othon Luiz Pinheiro da Silva, chairman of the Special Projects Coordination Office—an agency in the Ministry of the Navy—budget cuts in the autonomous program for uranium enrichment forced a postponement. The IPEN hasn't received any new fuel for this reactor since 1980 because of Brazil's decision not to sign the Treaty on Nonproliferation of Nuclear Weapons. Ever since then, the institute has been rationing the last charge it has on hand.

According to Adm Pinheiro da Silva, this has been a "pretty tight" year financially. Things got so bad that any expenditure of more than 2,000 new cruzados required his personal authorization. The budget this year was $16 million. For 1990 the requested budget—not yet approved—is $50 million, of which 70 percent would go for investments, mainly in uranium enrichment facilities. The funds come from the Ministry of the Navy itself, as well as from other government bodies such as FINEP [Funding Authority for Studies and Projects], he said.

The autonomous project has already achieved the capability of enriching uranium to 20 percent. According to Pinheiro da Silva, there is no plan to exceed that level, which rules out use of the enriched uranium for military purposes.

The Aramar Center processes an average of 400 kg of 5-percent enriched uranium for general research annually (despite having the technology to attain 20-percent enrichment). Brazil ranks fifth in the world in terms of uranium reserves. According to the admiral, the one-third of Brazil's territory that has been prospected harbors an estimated 310,000 tons of uranium, enough to run 30 1,200-MW reactors (such as Angra II and III). The nation's reserves are concentrated in the states of Bahia and Ceara, and in Pocos de Caldas (Minas Gerais). He also said that economic factors have led to a shift in uranium mining activity to Bahia and Itataia (Ceara) and away from Pocos de Caldas.

New Reactor

In 1991 work will begin on the installation of a reactor having 11 MW of electrical power (48 MW of thermal power). This should give the research center the capability to build much larger reactors, such as the ones at the Angra II and III nuclear plants, which have 1,245 MW each. According to the official, all the equipment has been ordered from Brazilian industry—over 160 companies.

The autonomous uranium enrichment program has absorbed $297 million since its inception 10 years ago. This is 95.8 percent less than what was spent on the official program for enrichment by the jet-nozzle method, which has now cost the country $7 billion.

Pinheiro da Silva suggests that the technology developed at Aramar be used to set up small nuclear power plants to generate electricity in regions remote from the public power network. "Today, about 40 percent of Brazil's population still has no electricity in their homes," he noted. The Northeast would be a good place to start such a project. "We could set up 100 MW plants very safely," he stated. The official has calculated that the energy produced by such units would cost from $.020 to $.030 per kW-hr.

[Box, p 14]

Fire Drill

Besides encountering the unusual sight of armed marines dressed in camouflage, visitors to the Navy's Aramar Experimental Center—where the program to enrich uranium by the ultracentrifuge method is under way—were surprised yesterday by a fire drill at the facility.

Fire drills are held 8 or 10 times in a 6-month period and only 3 of the 800 Aramar employees know in advance when they will take place, we were told yesterday by Jose Claudio Pedrosa, an engineer from the production division of the plant and one of those who schedules the drills. The alarm began to sound at 1630 and the drill was over in a few minutes.

According to Admiral Othon Luiz Pinheiro da Silva, there is no risk that contamination will leak from the Ipero facility because the rooms where the uranium enrichment centrifuges are located operate at an atmospheric pressure lower than the outside pressure, i.e., in a vacuum.

IPEN Develops Process To Make Special Oils

90WP0032C Sao Paulo GAZETA MERCANTIL in Portuguese 12 Dec 89 p 14

[Report by Rita Karam in Sao Paulo]

[Text] The Institute for Nuclear and Energy Research (IPEN) has succeeded in synthesizing fluorated oils, which Brazil has been importing from DuPont and Montedison. These lubricants have a high degree of chemical inertia, which means that they are nonreactive, i.e., they do not react either with bases (hydroxides) or with acids, explains Ademar Benevolo Lugao, an engineer in IPEN's radiations division.

Perfluoropolyether (fluorated oil) can be used in autovacuum processes. These are utilized, for example, to make color TV tubes and equipment for microanalysis; or oxygen equipment where protection must be provided so that the gas, which is highly reactive, does not react with the lubricant; or in making computer tapes—to reduce friction between the tape and the mechanism.

"This is an important step in the process of obtaining uranium hexafluoride (nuclear fuel) and sulfur hexafluoride (used in electrical insulation)," said Lugao.

Its resistance to high temperatures and ability to prevent chemical reactions also justifies its use in the nuclear and military field, adds Antonio D'Angelo, marketing director of Montekley Industria Quimica, a firm that resells fluorated oil made by the Italian firm Monteflus SpA, part of the Montedison group.

"We sell about 500 kg every year of that product in the form of oil and grease," reports D'Angelo, adding that close to 80 percent of the domestic market for the product—which he estimates at a ton and a half a year—is supplied at the time the equipment that needs it is purchased. "The oil is supplied with the equipment," he said. Montekley also sells organic peroxides that it makes in Brazil under license from the Montedison group. Peroxide is used to vulcanize rubber and plastics. DuPont of Brazil also offers this product, imported from its parent company.

Process

Fluorated oil is obtained from tetrafluoroethylene, the monomer used to get polytetrafluoroethylene, the nonstick compound better known as Teflon (a DuPont trademark). To obtain the oil, the monomer is subjected to pyrolysis—heating until the bonds between molecules rupture and form new compounds. These compounds are then polymerized in the presence of oxygen, yielding the oil, Lugao explained.

The IPEN invested 2 and ½ years in developing the product, at an estimated cost of 200,000 BTNs (National Treasury Bonds), and succeeded in obtaining the oil only about 3 months ago, the institute's engineer told us. The achievement is the result of IPEN's having mastered the technique of polymerizing PTFE (polytetrafluoroethylene, or Teflon).

The institute is now beginning to study surfaces fluoration, with the goal of reducing fluid permeation and increasing chemical inertia and the lubricating action of fluid retainers.

[Box, p 14]

Nonstick Know-How

The road that brought IPEN to obtain fluorated oils was opened in 1979 when IPEN, with backing from Japan International Cooperation Agency (JICA), began research to master the process through which the nonstick compound known as Teflon (Dupont's trademark for its coating) is made. Eight years and 500,000 BTNs later, the institute has achieved the intermediate technique in the process, which is the conversion of the refrigerant 22 (obtained from hydrofluoric acid and chloroform) into polytetrafluoroethylene (Teflon).

It remained, then, to make the entire process feasible—every step from the obtaining of the refrigerant gas to the various types of polymers. IPEN approached several industrial firms, including Nitroquimica, a unit in the Votorantim group. The cost of the process has been estimated at 500 million new cruzados according to Lugao, who said that the refrigerant gas costs $8 per kg in Brazil, while the world price of Teflon ranges between $9 and $12 a kg. Two kg of gas are needed to make 1 kg of the nonstick compound, Lugao said.

Rubens Petri of Nitroquimica said, however, that cost was not the main factor behind the decision not to make the nonstick compound in Brazil. "For more than a year we studied a proposal with Dupont but we felt that it would take quite awhile to get a return on our investment," said Petri.

Experimental Rockets Fired From Alcantara

90WP0032D Sao Paulo GAZETA MERCANTIL in Portuguese 12 Dec 89 p 14

[Text] The Ministry of Aeronautics, acting through the group responsible for readying the Alcantara Launch Center in Maranhao, began yesterday to launch a series of 20 small experimental rockets in order to calibrate the space center's equipment, to be inaugurated on 14 or 15 February 1990. With the launching of the Sonda III rocket in the presence of President Jose Sarney and aeronautics minister Brigadier Octavio Moreira Lima, Brazil will enter the exclusive club of nations that have mastered aerospace technology. The launch center's test rockets are 1 meter long and reach an apogee of 15 km. Twenty tests will be made between now and 14 February to calibrate the two radar tracking stations in Alcantara

and Sao Luis (on Raposa beach) and to train the technicians from the Space Activities Institute (IAE) and the Sao Jose dos Campos Aerospace Technical Center (CTA) in Sao Paulo.

Editorial Urges Rigid Safety Standards

90WP0032B Sao Paulo O ESTADO DE SAO PAULO in Portuguese 11 Jan 90 p 3

[Editorial: The Radiation Risks We Face]

[Text] Although not considered alarming because of its proportions, it is disturbing—and certainly very intriguing—that right in the middle of the neighborhood of Santo Amaro, near Joaquim Nabuco Street, there is a facility that processes monazitic sands and poses a threat because of radiation leaks (exposure) at levels far above those permitted by the National Commission for Nuclear Energy (CNEN) and the International Atomic Energy Agency (IAEA). It is quite possible that this exposure has caused health problems to those who have been in the vicinity of the plant, although it would not be easy to determine how many people may have been affected and to what degree.

According to a report by Tania Malheiros that appeared in a recent issue of this paper, the problems were referred to in the "Environmental Control Report" put out by Nuclemon, the company in charge of the plant, which is known as Usam. Concerned about the possibility of contamination of the community, experts from the Institute of Radioprotection and Dosimetry (IRD) drafted a series of opinions proposing the closing or relocation of the facility.

Under CNEN norms, the maximum permissible limit of exposure to radiation for individuals who do not work at the plant is 100 millirems (a unit of exposure to external radiation) per year, or approximately 12 microrems (a unit equivalent to a thousandths of a millirem) per hour. But at Usam, that exposure has been as high as 74.3 microrems per hour, or six times more than allowed under the standards. The reporters also learned that the dosimeters (equipment designed to detect the level of external radiation), were not properly installed, either inside or outside the building where Usam functions. According to technicians from the nuclear industry, if the dosimeters had been correctly placed at a distance of 1 meter above the floor rather than 3—as they are now—they would have detected even greater levels of radiation exposure.

Although the cases cannot be compared in terms of seriousness, it is hard not to recall the tragedy caused by accidental exposure to cesium in Goiania, which horrified the public. What worries us, above all, is that the Brazilian public is, in general, in the position of an "innocent and defenseless bystander" as regards the countless devices that are capable of producing nuclear radiation, since safety standards are disregarded.

Some basic questions need to be asked about the responsibility of the agents of public authority who are in charge of supervising that industrial sector. How can they explain the fact that a trouble spot that has existed for so long—Usam has been operating since 1942—and has already been noticed by experts, hasn't been solved? At a time when CNEN standards are flaunted, i.e., when radiation emissions are six times greater than permitted, what is that government agency doing to correct the problem? Didn't they, for example impose more effective controls or move the plant to a more remote site that would pose less risks to the public?

And as for Cetesb [State Basic Sanitation Technology Company], which makes it so hard for companies that try to set up facilities in this city because of the strict environmental preservation requirements it imposes, what does it think about a plant that emits nuclear radiation above permitted levels operating in Brooklin Paulista, a residential neighborhood? And what about City Hall?

We have now irreversibly entered the nuclear energy era, which entails an always-risky coexistence with radiation. No matter how far we travel along the road to technological sophistication in that sector—which is desirable and may eventually be vital to our development—if we do not at the same time arm ourselves with rigorous safety systems we will be condemned to live under an atmosphere of constant dread of an accident caused by nuclear radiation, or contamination by "atomic waste." Such incidents usually have catastrophic consequences, affecting not only individuals, but generations.

Commentary on Angra 1 Nuclear Plant Operation

PY1801142090 Rio de Janeiro O GLOBO in Portuguese 17 Jan 90 p 23

[Report by Ramona Ordonez]

[Text] "Brazil enters the nuclear age. Angra 1 is operational," read a headline in O GLOBO in its 18 January 1985 issue. The item reported on the inauguration of the first Brazilian nuclear plant on a rainy 17 January, marking the beginning of the commercial operation of Angra 1. Five years have passed, and $25 million (307.5 million new cruzados at the official exchange rate) have been spent.

The 626-megawatt plant was turned back on yesterday morning, and now, on its anniversary, it is operating at 10-percent capacity and should be producing at 35 percent within the next few hours. The technicians guarantee that Angra 1 will prove this time that it is no longer "a firefly, on-off plant."

With the exception of the buildings housing the reactors, the plant is quite different from the one inaugurated in 1985. Pedro Figueiredo, the acting thermonuclear area director of Furnas, the company that operates the plant, explained to O GLOBO that 13 major and other minor

modifications have been made, and that Angra 1 is operationally one of the best in the world and is more secure than it was before.

From 1985 to 1989, Angra 1 generated 8.8 billion kilowatt hours of electricity, enough to light 7 million houses for an entire year. Sergio Guimaraes, who is the assistant to the thermonuclear director and who was an Angra operator, affirmed that despite its constant problems Angra 1 has helped in training Brazilian technicians and has been useful in the development of new technologies by Furnas, industry, and the scientific community.

Angra 1 suffered so many problems that Furnas filed a suit with the Arbitration Court of Paris against Westinghouse Company, demanding indemnification for damages resulting from errors in design, in the steam generator, and in the electricity generator.

Modifications made over the past 5 years range from the replacement of transformers and motors, the modification of pumps, and the replacement of 48,000 vapor condenser tubes to the installation of environmental control and a new computer system that begins operation today.

The Brazilian Government purchased the Angra 1 plant from the U.S. Westinghouse Company, and construction began in 1970. The plant installation was marked by several problems both in nuclear equipment and in conventional electric equipment.

Angra 1 cost $1.8 billion. The testing of its equipment began as recently as 1977. The atomic fuel was loaded in 1981 and energy produced by the plant was for the first time fed into the southeast electricity grid in 1982. It reached 100-percent generating capacity in February 1984 when it was approved for commercial operation. Since its inauguration on 17 January 1985, Angra 1 has been shut down 23 times.

CUBA

Nuclear Power Plant Construction Progress Noted

FL1901221690 Havana Radio Reloj Network in Spanish 2053 GMT 19 Jan 90

[Text] Cuban and Soviet specialists set a world record when they installed a 400-ton piece of equipment. They lifted the heavy structure and placed it in the first reactor of the nuclear power plant under construction in Jaragua, Cienfuegos. The polar crane, which will move in a circular fashion inside the reactor's hermetically enclosed area, was placed in 14 hours. This piece will make the installation of the technological equipment of the project possible.

The installation of the above-mentioned equipment is an important step in the construction of the first reactor. It makes possible the construction sequence to totally enclose the dome by placing the blocks.

The crane is composed of two sources weighing 105 tons each, with a 12-meter gap between them, and will move on a circular track.

INTERNATIONAL AFFAIRS

Arab Missile Programs Assessed

51003046 Geneva JOURNAL DE GENEVE in French 15 Dec 89 p 5

[Article by Serge Ronen: "Strategic Arms: The Arab World Is Approaching Parity With Israel"; first paragraph is JOURNAL DE GENEVE introduction]

[Text] By launching a three-stage missile capable of putting a satellite into orbit, the Iraqi government has placed itself in the vanguard of countries possessing space technology. [It also claims to have] a missile with a range of 2000 km, capable of penetrating deeply into the interior of Iran or of reaching any target, civilian or military, in Israeli territory.

Jerusalem—The Pentagon, according to sources close to it, is inclined to confirm the capabilities of the Iraqi ballistic missile. Jerusalem, however, does not seem to view this as more than yet another stage in the arms race. In addition, Syria, no longer able to obtain surface-to-surface missiles from its traditional supplier (the USSR), is seeking to buy them elsewhere. According top the weekly LE POINT, widely cited in the Israeli press, the unwillingness of the Soviets to supply offensive weapons to such poor credit risks (the constraints of pragmatism!) has led the Syrian government, generously supplied with funds by Colonel Qadhdhafi, to approach Beijing about supplying 140 medium-range (600 km) missiles, known to the military as M-9. China has issued a vigorous denial. One is reminded here of the equally firm denial which China hid behind at the time of its shipment of CSS-2 intermediate-range missiles to Saudi Arabia.

Syrian-Chinese Contract

An Israeli source states that the information in the French weekly appears to confirm what one already knew. A Syrian-Chinese contract has indeed been signed, but the M-9 missiles have not yet arrived in Damascus. The sudden arrival in the Chinese capital of the American Deputy Secretary of State Lawrence Eagleburger and National Security Advisor Brent Scowcroft is supposed to have been for the main purpose of dissuading the Chinese government from selling ballistic missiles to the government of Hafiz al-Asad. This is at least what this Israeli source maintains, while asserting that the possession of these weapons (each of which carries a ton of explosives) by the Syrian army would not permit Syria to eliminate the lead which both Iraq and Israel hold in this field. The M-9 is capable of hitting a target as far away as the Negev Desert, but its employment would by no means assure strategic superiority. If, on the other hand, the Iraqis really are capable of placing a spy satellite into orbit, then the Middle East as a whole would be entering into a new stage in the military technology race. The Arab world is rapidly approaching strategic parity with Israel. Israeli scientists, headed by Professor Neeman, still of course have a considerable lead, thanks to the Ofeq-1 experimental satellite, but for how long? At several secret Iraqi bases, engineers of every nationality (especially Egyptians, Germans, Swiss, Argentines...) are steadily working to provide the regime of Saddam Husayn with a long-range missile for his chemical weapons.

EGYPT

Inshas Nuclear Reactor Resumes Operation

NC1001085390 Cairo MENA in Arabic 0726 GMT 10 Jan 90

[Text] Cairo, 10 Jan (MENA)—Egyptian nuclear scientists have successfully renovated the Inshas nuclear reactor which had been inoperative for 10 years. The Inshas reactor, Egypt's first nuclear reactor, was built and began operations in the early sixties.

In today's edition, AL-AHRAM notes that Egyptian nuclear scientists, in cooperation with scientists at the International Atomic Energy Agency [IAEA] in Vienna, have succeeded in upgrading the Inshas nuclear reactor so that it will serve not only research purposes, but also have industrial applications and produce important isotopes used in medical treatment, particularly iodine-131 which is used in radiation treatment and the treatment of tumors.

Dr Hamid Rushdi, head of the Atomic Energy Authority [AEA], said that the renovations at the Inshas reactor include the control of radioactive monitoring, measuring, and alarm instruments. The improvements will enhance safety. The reactor, he said, has actually begun operating in a safe and reassuring manner.

Dr Rushdi said that the reactor will be able to function for at least the next 10 years, by which time the new experimental reactor, which is currently under construction and whose capacity is 10 times greater, will be completed. Egypt, he said, not only has the ability to operate nuclear research reactors and produce radioactive substances, but can also construct, operate, and carry out maintenance on projects involving the production of nuclear energy.

Dr Muhammad Sultan, head of the Inshas nuclear research center, said that Egyptian atomic scientists exerted great efforts to renovate the reactor. These scientists replaced the Soviet-made control and safety systems with Western ones. This task, he noted, was accomplished by Egyptian hands and expertise exclusively, without the reliance on Western expertise which would have been extremely costly.

Dr Sultan said that the operation of the reactor means Egypt will be able to stop importing radioactive material needed for medical purposes and will become self-sufficient in this area.

AEA Professor Dr 'Abd-al-Raziq Husayn said that the improvements to the nuclear reactor will for the first time enable Egypt to carry out precise photographic examination of the containers, the substances used in the construction of nuclear reactors, and the nuclear fuel being used.

Meanwhile, IAEA expert Dr (Victor Wimts), said that Egypt has sufficient expertise to build nuclear reactors and make technological improvements. Many Egyptian scientists have distinguished themselves in this area while working abroad and Egypt has the necessary expertise to enter the field of building and operating nuclear power plants.

INDIA

Indian-Pakistani Nuclear Facility Pact Ready

BK1301061090 Delhi Domestic Service in English 0435 GMT 13 Jan 90

[Text] All formalities with regard to the exchange of instruments of ratification of the India-Pakistan agreement on prohibition of attack on each other's nuclear installations has been completed by both the countries. Disclosing this, the Indian High Commission in Islamabad has said that the instruments of ratification will be exchanged at a mutually convenient date as early as possible.

Our Islamabad correspondent, Suresh Chopra, reports that the agreement is subject to ratification and shall come into effect from the date on which the instruments of ratification are exchanged.

Regional Seminar on Nuclear Power Meets in Bombay

Blix, Others Speak

51500056A Bombay THE TIMES OF INDIA in English 19 Dec 89 p 5

[Text] Bombay, December 18—There is a need to demystify nuclear energy generation so that it does not evoke fear, Mr Hans Blix, director-general of the International Atomic Energy Agency (IAEA), said today.

Delivering the keynote address at the IAEA's regional seminar on nuclear power, Mr Blix felt that part of the reason why this technology gave rise to fear was because it was new and that people had not "tucked" it away in their minds.

Cautioning against complacency about the risk of accidents, he said that as correct a picture as possible of the risks and damages involved should be presented to enable the public to make realistic comparisons between the advantages and disadvantages of the various types of energy.

Regarding the problem of nuclear waste Mr Blix pointed out that 7,000 tons of spent fuel were produced by the entire world's nuclear-generated electricity in 1988.

If the same amount of electricity had been generated by coal, 100,000 tons of heavy toxic metals would have been produced he claimed. This would be apart from the large quantities of gases, sulphur dioxide, nitrogen oxide and carbon dioxide spewed into the atmosphere in the process.

Addressing the concern expressed over nuclear proliferation, Mr Blix said the risk would not be significantly reduced by a moratorium on further nuclear power. He claimed that the transfer of nuclear technology, hardware and fuel for electricity generated remained one of the principal methods of obtained legally binding and verified commitments to an exclusively peaceful use.

Mr Blix asserted that since environmental concerns were likely to make the expansion of fossil fuel-based power more questionable and since there were simply no other options for generating power, the nuclear option had become indispensible. A nuclear safety culture must be maintained world-wide and the developing countries, too, would have to prepare themselves for entering the nuclear age, he added.

Inaugurating the seminar, Dr M. R. Srinivasan, chairperson, Atomic Energy Commission, said the initial euphoria and support given to the nuclear establishment by the media gave way to criticism and misgivings.

Then, Dr Srinivasan said, came a period when several nuclear plants encountered significant cost overruns and delays. At this crucial phase, however, the nuclear establishment remained insular and did not respond in an enlightened manner. This was when the anti-nuclear movement became strident and organised, he argued.

Instead of a reasoned dialogue, posturing became the order of the day on both sides of the nuclear divide leading to a loss of credibility.

The situation had changed over the past five years, with nuclear establishments taking their task of informing the people more seriously; there was now greater "transparency" regarding the working of nuclear power plants, he added.

Dr Srinivasan said the only way to avoid a long-term build up of carbon dioxide in the atmosphere in India was to burn less fossil fuels. This would entail a mix of options including conservation, use of nuclear energy and renewable sources, he suggested.

Introducing the two-day seminar, which also has participants from Iran, Bangladesh and Pakistan, Dr P.K. Iyengar, director, BARC, said that regional co-operation had always been accorded high priority by India. As far back as in 1958, Mr Jawaharlal Nehru had, during the dedication ceremony of the Apsara reactor, invited the neighbouring countries to work with it, he said.

India was willing to share not only its scientific knowledge but also the troubles, tribulations and lessons learnt in the course of developing this advanced technology, Dr Iyenger concluded.

Blix Meets Press

51500056A Bombay THE TIMES OF INDIA in English 21 Dec 89 p 5

[Text] Bombay, Dec 20—Each country which accepts the NPT (Nuclear Non-Proliferation Treaty), does so as a sovereign act, Dr Hans Blix, director-general of the International Atomic Energy Agency, told reporters on Monday night.

Dr Blix is in Bombay in connection with a regional seminar on nuclear power, attended by media persons from Pakistan, Bangladesh, Iran, among other Asian countries.

He said he did not suggest any modifications in Indian nuclear policies to the Prime Minister, Mr V. P. Singh, in the course of his meeting in Delhi. Neither did he suggest any safeguards, which he said, would be provided only as a service to member states. If they wanted to convince the world that they were not misusing their nuclear energies, a third country would play neutral watchdog.

The IAEA plans to draft a code of conduct for members countries. A standard will be adopted and it will not dictate that nuclear waste cannot be transferred from one country to another, but that no country must transfer waste without an export/import licence and certainly not if the importing country does not have adequate facilities to dispose of the waste.

Dr Blix said the embargo to sell nuclear power plants to pakistan applied only to the United States.

The IAEA helps the third world countries to set up nuclear power plants in different ways. A large technological co-operation programme with an allocated budget is one such. Less than half of this budget is used in the nuclear power sector proper.

The IAEA also runs training programmes for people in the nuclear power industry and nuclear scientists from developing countries are sent there. In addition, energy planning like electricity demand projections, is taught to these member states.

In all, 140 states worldwide subscribe to the NPT. It is rumoured that developed industrialised countries dispose of their low level radio-active waste in the third world countries. However, according to Dr Blix, investigations have proved this allegation baseless. Only Nigeria was found to contain toxic, but not radio-active waste, he said.

Referring to environmentalists' opposition to nuclear power, Dr Blix said nuclear power plays a significant role in the reduction of the greenhouse gases. He added that conservationists must realise that the environment issue cannot be solved without first tackling the issue of population.

Scarcity of funds, manpower and lack of a safety infrastructure are major impediments which a country must overcome before setting up a nuclear power plant, Dr Blix stressed. He admitted that nuclearisation of energy sources by nations round the world had stagnated somewhat in the last few years.

The Atomic Energy Commission chairman, Dr M. R. Srinivasan, said series building is very important for cost stabilisation. India had already gone in for 14 nuclear power reactors and is expected to go in for another 16 reactors of 500 MW capacity by the end of the century, he added.

Regarding the fear that people living close to nuclear power reactors were more like to contract cancer, Dr Srinivasan contended that the Agency's research along the Kerala coastline where an active project is going on, has not so far indicated that there are more cancer deaths in Kerala than elsewhere. He said at least three reactors would go critical in the next year.

Operations, Plans for Kalpakkam Reactors Told

51500057A Madras THE HINDU in English 10 Dec 89 p 3

[Text] Madras, Dec 9—The two units of Madras Atomic Power Station, Kalpakkam, have been generating electricity for the past one month at 75 percent of their capacity viz more than 160 MW out of 235 MW capacity, according to the Chief Superintendent of MAPS, Mr. V. Rangarajan. The two units had been generating power at 50 percent of their capacity from June.

He said the Safety Review Committee had given the clearance after October 28 to MAPS authorities to operate the two reactors at 75 percent of their capacity. They were now generating 160 to 175 MW each.

Mr. Rangarajan said that the first unit was under shutdown from last Wednesday as some statutory tests to check any leak in the reactor-building had to be conducted. The unit would start functioning by weekend viz December 15.

The two reactors were expected to reach their full-rated power by September, 1990 when further modifications would be completed.

The MAPS engineers had undertaken a sophisticated "trouble-shooting" operation to bring the two units on line after the baffle-plates of the heavy-water inlet manifold inside the reactor-vessels had got damaged.

The baffle-plate distributes the flow of heavy water to the entire cross-section of the calandria and also cools the total area.

IRAN

Uranium, Molybdenum Discovered in 10 Areas

90OI0083X Tehran RESALAT in Persian 2 Dec 89 p 11

[Text] Mr. Ayatollahi, the Atomic Energy Organization's under secretary for primary materials and fuel, in an interview with a Central News Unit correspondent, answered the correspondent's questions regarding uranium deposits.

The Atomic Energy Organization's under secretary for primary materials and fuel, responding to the correspondent's question regarding the extent of the uranium deposits recently discovered said, "Efforts for finding uranium have been centered in 10 areas: In the first stage, 3,200 tons of uranium and 4,200 tons of molybdenum were discovered."

PAKISTAN

PRC To Help Build 2d Nuclear Power Station

BK1501090690 Islamabad Overseas Service in English 0800 GMT 15 Jan 90

[Text] Pakistan is discussing the possibility of building nuclear power stations with other countries to meet its energy requirements. This was stated by the chairman of the Pakistan Atomic Energy Commission [PAEC], Mr. Munir Ahmed Khan, while inaugurating a three-week course on quality assurance for mechanical equipment in Islamabad this morning. He said that Pakistan is planning to build its second nuclear power station of 200 megawatt with the assistance of the People's Republic of China.

The chairman of the PAEC emphasized the need for quality assurance measures on all equipment installed in nuclear power plants. He said Pakistan is fortunate that so far there have been no radiation accidents in any of its nuclear facilities. The release of radioactivity to the environment in the country has been limited within 1/10th of the permissible limit.

Mr. Munir Ahmed Khan said the commission is setting up a national nondestructive (?processing) center in Islamabad, which would be ready in the next few years. The center will play a leading role in increasing the awareness of quality control in the country. The course is being attended by experts from various industrial units.

Nuclear Weapons: Open Announcement Supported

90OI0089Z Karachi JASARAT in Urdu 19 Nov 89 p 3

[Editorial]

[Text] According to All India Radio, Pakistan's Army Chief of Staff, General Mirza Aslam Beg, in an interview with a Japanese weekly journal, said that Pakistan will have to make nuclear weapons for its defense and for enhancing the defensive capabilities of its army. He said only under these conditions will our enemies not have the courage to attack us. Aslam Beg also said that Pakistan was making missiles that would have the capability of hitting objects at a distance of 200 kilometers, thereby increasing the country's defensive capability enormously.

General Aslam Beg is the first Pakistani military officer to openly support nuclear weapons, and this is a position which Jamaat-i-Islami has been emphasizing from the very first day, and now many other political parties are also confirming this position. But the Pakistani government has for some time now adopted a very apologetic and stealthy attitude, as if it were a shameful act to protect oneself from enemies and strengthen one's defensive capabilities. But the fact is exactly as General Aslam Beg has indicated. If Pakistan's defensive capabilities are clear and convincing, and if it has nuclear weapons, then none of our enemies will dare to attack us. This is something we have to encounter. There is nothing wrong fundamentally or morally in admitting this fact, especially when the possible enemy Pakistan has to confront is constantly increasing its nuclear power without any regret or remorse, and who exploded a nuclear device in 1974, and is now busy making all kinds of nuclear weapons. Against whom the Indian weapons will be used is an open secret. India keeps on singing hymns of peace, even after exploding nuclear devices. On the other hand, when Pakistan proposed in the United Nations that the region surrounding the Indian Ocean be declared a nuclear-free zone, it was India that opposed this plan because it knows very well that this plan would be directed against itself. It is worth mentioning that our military officers have also come to realize that only by being prepared militarily can they protect themselves. The weaker countries invite the mischievous countries themselves. All along, the Pakistani government, fearing the loss of U.S. aid, has been saying that it has no intention of making nuclear weapons. But it should realize that if it is attacked, as has usually been the case, U.S. aid will be of no use, and that the United States or for that matter no other country will fight for Pakistan. On the other hand, what is to be seen is the attitude of the United States towards countries like Israel, Argentina, South Africa, or India who have been making nuclear weapons. Isn't Israel the greatest recipient of U.S. aid and backing, and isn't the United States trying to increase its friendship with India? In today's world politics, the smaller countries have become the necessities of the big countries and, as such, the fear of big countries should be removed. Even so the U.S. authorities, scholars, and members of Congress accuse Pakistan of making nuclear weapons. As it is, accusations are being levelled against Pakistan. Then why shouldn't we come out in the open and state that Pakistan will make nuclear weapons for its own security and survival and that this is indispensible for its existence. We once again wholeheartedly endorse the stand taken by Aslam Beg. He has certainly exhibited courage.

U.S.-Soviet Nuclear Nonproliferation Talks Held 8-11 Jan

TASS Report

LD1101185790 Moscow TASS in English 1847 GMT 11 Jan 90

[Text] Moscow, 11 Jan (TASS)—The new round of Soviet-U.S. consultations on the nonproliferation of nuclear weapons was held in Moscow on January 8-11.

They focused on a wide range of issues, including preparations for the 1990 conference to review the Nuclear Non-Proliferation Treaty, further efforts to shore up the international nuclear nonproliferation regime, enhance the effectiveness of the system of international guarantees, joint support of the activities of the International Atomic Energy Agency and the situation in several regions of the world from the point of view of nuclear nonproliferation.

The consultations passed in a businesslike and constructive atmosphere. Both sides reaffirmed their commitment to the cause of preventing the spread of nuclear weapons, emphasised the need scrupulously to observe by all signatory states the assumed obligations and expressed readiness to give assistance to other states in peaceful uses of atomic energy under effective international control.

Ambassador at large Richard Kennedy, who heads the U.S. delegation at the consultations, was received by Soviet Deputy Foreign Minister Vladimir Petrovskiy. During the talk both sides noted the importance of continued constructive cooperation between the USSR and the United States in strengthening the nuclear nonproliferation regime and lending a universal nature to the Nuclear Non-Proliferation Treaty.

The sides said the USSR and the United States were ready to promote the success of the forthcoming conference to review the treaty. They expressed confidence in the usefulness of the contacts between the two countries in the nonproliferation field and the need to preserve the practice of holding bilateral consultations.

Jack Matlock, U.S. ambassador to the USSR, took part in the talk.

Official Assessment

LD1201174890 Moscow TASS in English 1700 GMT 12 Jan 90

[Text] Moscow January 12 TASS—A regular round of Soviet-American consultations on nuclear weapons nonproliferation ended in Moscow on January 11. "The characteristic feature of the recent talks is that they were attended by representatives of the new U.S. Administration who, in this way, confirmed their commitment to the policy of nonproliferation," Soviet Foreign Ministry spokesman Vladimir Pavlinov told a briefing here today.

As the depositary countries of the 1970 Non-Proliferation Treaty, the Soviet Union, the United States and Britain carry special responsibility for its preservation. It is important to interact not only with the depositary countries, but with all the 140 states participating in this treaty, Pavlinov said.

"Now, it is particularly necessary to support the treaty because we have entered the stage of real disarmament and any breakdowns in the nonproliferation process could affect negatively all the talks that are currently under way," Pavlinov emphasised.

During the recent consultations the sides considered tactical steps which the depositary countries could undertake to hold a conference in 1995 to decide for how long this Non-Proliferation Treaty should exist.

The sides voiced support for the efforts of the International Atomic Energy Agency (IAEA), the chief body monitoring the observation of the Non-Proliferation Treaty. They also considered some regional nonproliferation aspects.

Pavlinov pointed out the responsible attitude of countries capable of developing their own nuclear weapons towards realising their scientific and technological abilities and their understanding that they would harm their own security, should they overstep a certain line. The countries that demonstrate such a sensible approach include Argentina, India and Brazil.

Book on International Nuclear Export Controls Reviewed

90WP0022A Moscow OBSHCHESTVENNYYE NAUKI V SSSR; SERIYA 4 GOSUDARSTVO I PRAVO (REFERATIVNYY ZHURNAL) in Russian No 6, Oct-Dec 89 pp 179-184

[Review by G.B. Agabekov of book "Yadernyy eksport: mezhdunarodno-pravovoye regulirovaniye" [Nuclear Export: International Legal Regulation] by P.G. Palamarchuk. Moscow: Nauka Publishing House, 1988, 128 pp]

[Text] The significance of the topic being researched in the work under review is described in a foreword written by A.I. Ioyryshiy, head of the sector for legal problems in the use of nuclear power of the Institute of State and Law of the USSR Academy of Sciences. It is noted therein in particular that "problems of regulating nuclear exports to nonnuclear countries could be resolvable with the obligatory recognition and fulfillment of all the principles and provisions of complete IAEA monitoring" (p 6).

The author in turn points out in the introduction that research undertaken within the framework of the IAEA has shown that coal and nuclear fuel will be the sole available basic and major resources of electric power at the end of this century and beginning of the next due to reductions in world petroleum reserves. The share of nuclear-power engineering could reach 25 to 50 percent

of all electric-power generation by 2020-50, if the negative perceptions of society that have arisen with especial keenness of late are surmounted.

The author, providing an overall panorama of the state of production, utilization, including for military purposes, and trade in relation to nuclear fuel, as well as the key elements of the "nuclear policy" of the leading powers in this section of the book, emphasizes the necessity of reaching universal agreement among exporters on complete monitoring. "The state of the nuclear market," he writes, "presently indicates the extreme importance of pursuing a coordinated policy in the realm of nuclear trade among the supplier countries and the consumer countries for the purpose of limiting the spread of nuclear weapons and ensuring support for the development of nuclear-power engineering" (p 21).

The work consists of six chapters devoted to defining aspects of the international legal regulation of nuclear exports.

The first chapter opens up this issue apropos of the system of guarantees of the IAEA and the Nuclear Non-Proliferation Treaty (NPT), which took effect in 1970. Tracing the appearance and development of the system of guarantees, the author touches on the activity of the United Nations in this sphere along with the creation of the IAEA as a special international body called upon to monitor all nuclear material and all forms of nuclear activity in the world. The basic provisions of the NPT and the results of the conferences to review the effect of the NPT that were held in 1975, 1980, and 1985—at which the absence of violations of the basic obligations of the participating nations in observing the conditions of nonproliferation was ascertained—are set forth.

The second chapter covers the significance of additional organizational measures that provide for the use of guarantees in nuclear exports to countries that have not ratified the NPT. The provisions of the two memoranda of the principal nuclear supplier countries of 1974 are set forth. The first regulates questions of the export of original or special fissionable material, while the second covers the export of equipment or material specially intended or prepared for the processing, utilization or production of fissionable material. These memoranda "were a new and substantial step forward in the realm of the international legal regulation of nuclear exports" (p 44).

They at the same time consolidated the collective agreement of a large group of countries on the regulation of nuclear exports, in the interests of the nonproliferation of nuclear weapons, for the first time in history. The London Conference of 1978 and the "Guiding Principles of Nuclear Exports" that it adopted were another important step in that direction. Additional international legal documents were subsequently developed to the extent of the appearance of new and unregulated problems, which make it possible to conclude overall that the IAEA presently has "the right to monitor all types of technical assistance rendered by it" (p 50).

But the successes and accomplishments in this realm do not yet signify that certain differences in the approach of individual countries to the establishment of principles and standards obligatory for all, providing the essential guarantees in the interests of the international community, have been completely surmounted. "The threat of the spread of nuclear weapons across the planet," the author concludes on this issue, "thereby remains in force despite the marked strengthening of the conditions of nonproliferation in nuclear exports in the last decade. The ratification of the treaty by all of the nations that have not yet signed it, as well as the achievement of agreement among the nuclear suppliers in the principle of 'full guarantees' in the implementation of nuclear exports to nonnuclear countries that are pursuing or planning to pursue their own nuclear programs and, at the same time, refusing to join the NPT, are the paramount tasks to eliminate that threat in the near future" (p 54).

The third chapter touches on the nuclear fuel cycle and problems of nuclear exports. The author relates the goals and tasks of the IENFC (International Evaluation of the Nuclear Fuel Cycle) program that was adopted by the representatives of 40 countries and four international organizations at the Washington Conference of 1977. The practical steps that have been undertaken for the realization of this program, including the results of the concluding Vienna IENFC Conference in 1980, are illuminated.

The activity of the Committee for Secure Deliveries of the IAEA is also shown, and the significance of the decisions it has made is described. It is noted, relative to the question of international centers for the nuclear fuel cycle, that while the creation of such types of centers is under the internal jurisdiction of the nations, the advantages of international collaboration in the realm of the peaceful utilization and storage of spent fuel and wastes are obvious.

The fourth chapter analyzes responsibility for failure to observe the conditions of nuclear exports stipulated in contemporary international law. This issue is accordingly set forth from the point of view of international legal regulation before the entry into force of the IAEA Charter, according to the Charter and then, finally, in light of the London Agreements.

The specific features of the sanctions envisaged at the regional and national levels are revealed. The author dwells on the prospects for the employment of sanctions in practice, noting that "the policy of nonproliferation, one of the chief components of which is sanctions, is bearing positive fruit" (p 78). He touches on both the merits and the drawbacks of the prevailing system of IAEA sanctions using the example of the nuclear exports of Iraq. The actions of Israel as expressed in the raid of its aircraft on the Iraqi nuclear center at Tuwait, under IAEA guarantees, are condemned. "Thereby violating the principles of international law in the grossest manner and refusing to trust the system of IAEA guarantees," the work emphasizes, "the Israeli leaders lay claim to a

personal right to resolve issues of nuclear security" (p 81). A further strengthening of the IAEA sanctions system, which serves the aim of averting the proliferation of nuclear weapons, including in the realm of nuclear exports, must thus be sought.

The fifth chapter reviews the legal regulation of nuclear exports in the USSR.

The policy of the USSR in the realm of collaboration with other nations for the purpose of the peaceful utilization of nuclear power is described. It is noted that the USSR pursues this policy as one of the major world suppliers of nuclear equipment, technology and nuclear and special nonnuclear materials, as well as services in the nuclear fuel cycle, in complete and strict accordance with the Non-Proliferation Treaty and all other international legal documents regulating the activity of nations in this area.

The author, briefly covering the first legal acts in this issue, set forth and analyzes in detail the USSR Statute on Nuclear Exports of 13 Jan 82. That statute is regarded as "an effective means of ensuring the observance of the conditions of nonproliferation in the implementation of nuclear exports by the USSR" (p 91).

The sixth and last chapter is dedicated to the legal regulation of nuclear exports by the major capitalist nations—the United States, France, and West Germany—as well as the EEC. The basic features of the various national conditions in this area are shown.

The author emphasizes once again in conclusion the international significance of the problem he has researched, pointing out that the question of strict observance of the conditions of nuclear nonproliferation is directly linked with ensuring the peaceful development of international relations and the secure elimination of the danger of the use of nuclear weapons.

The 1974 memorandum on nuclear exports to nonnuclear countries that are not participants in the Nuclear Non-Proliferation Treaty (IAEA documents INFCIRC/209) is given as a supplement.

Eyewitness Describes 1953 Atom Bomb Test, Deaths

90WP0030A Copenhagen BERLINGSKE TIDENDE SONDAG in Danish 17 Dec 89 pp 15-16

[Article by Thomas Heurlin: "The Atom Bomb's Guinea Pigs"]

[Text] Semipalatinsk (Kazakhstan)—The Soviet Union failed to evacuate selected groups of the population in the danger zone when the first surface test explosions of the hydrogen bomb took place in the fifties. Most of them are dead. Only now dare the survivors speak out. They speak about their own suffering and deformed fetuses.

"The soldiers came to our village in August 1953. One officer told us that the people and the cattle of the entire area would be evacuated. The exception to this was 40 people—I was among them—who were told to remain."

The 59-year-old Tugaj Rakiembiev has limped to the room's only table to be interviewed. The large bald man is totally paralyzed on the left side. Due to his illness, he has been bedridden in the family's primitive wooden house for the last 30 years in the Kazakhstan village Karaul

Rakiembiev himself is in no doubt about the reason for his disease: As an unwilling guinea pig, he experienced the explosion of the Soviet Union's first hydrogen bomb.

Rakiembiev is one of the Soviet Union's few surviving victims of the bizarre experiments in the infancy of the atomic age.

Karaul is located only 100 km from the Soviet Union's atom bomb test area in the northeastern part of Kazakhstan. The 17,000 square kilometer area near the town of Semipalatinsk is not fenced off but an unending row of white poles, placed at three to four meter intervals, marks the border of Polygon as the locals call the test area. Cows are grazing next to the atom bomb craters and the villages and agricultural collectives along the white poles cultivate their crops in the dry and sun drenched fields.

Secret Examination

The trip from Semipalatinsk to Karaul progresses on a seemingly endless straight road. The reddish yellow desert sand is pushed up by the wheels and looks like banners behind the cars. The steppe desert is quite flat and does not change during the four hours the trip takes.

"We were left behind without any inkling of what would happen," says Rakiembiev. "The next morning we experienced a powerful flash of light, far stronger than the rays of the sun. The horizon became red, and a large black mushroom shaped cloud appeared. Shortly after the blast, a cloud of dust came toward us. An hour and a half later, soldiers appeared with gas masks and equipment and drove us away."

"Our names were called and recorded. They walked around us and scanned us with a dosimeter (an instrument for measuring radioactivity in the body, Ed.). After that, we were told to drink 20 centiliters of vodka."

The 40 unsuspecting test persons where then driven hundreds of kilometers away to another collective farm where they remained for 18 days until they were allowed to return to their village with the rest of the inhabitants. There, military doctors took blood samples from them.

With the Kazakherns traditional small black head covering, Talgot Slambekov sits and listens. He has known Rakiembiev his entire life and he was also one of the 40 whom the military picked out for the atomic experiment.

Slambekov says that the following year, in August 1954, he was picked up along with seven others of the 40 guinea pigs and driven to the nearest large town, Semipalatinsk, where they for a month and a half were examined by doctors at a closed special clinic, "Dispensary Number Four."

Few Survived

"The director of the clinic told us that the studies were being made for science and for the benefit of generations to come. We did not dare protest at that time. The times were different. Our wives, however, did go to the party because they were afraid that we had been taken away to be shot," says Slambekov.

Rakiembiev says that of the original 40 people who experienced the brutal experiment, only seven are alive. Most died of leukemia, bone, stomach, or brain cancer, or heart disease before they reached 50.

With a state retirement pension of 112 rubles (below 200 kr.) a month, Rakiembiev is an economic burden for his children. And when he sits there, his big body good for nothing, it can be clearly seen that being a burden is his great worry:

"I have sat here at home for over 30 years. I am of no use to neither the family nor society. Just the opposite. That is how the situation is."

Rakiembiev's story is only one of numerous human tragedies among the population around the bomb test area. But the fear of reprisals and the isolated life on the barren desert steppe has for four decades kept the consequences of almost 500 atom explosions hidden from the outside world. The Semipalatinsk region is closed to foreigners. Visas are only issued in special cases. No Western journalists have previously visited the villages along the bomb test area which today are indicated on the World Atlas.

Death Rate Confirmed

It was only with glasnost and the public acknowledgement in February this year by a local people's movement against the atomic blasts that the inhabitants of the villages have dared open their mouths. All the older people can tell about their personal experience concerning the mushroom clouds from 1949 to 1963, the period when 161 atmospheric atomic tests were conducted in the area. Since the 1963 agreement between the United States and the Soviet Union on the ban of nuclear blasts, the tests have been conducted underground.

Now, the authorities have been forced to take the stories of the old-timers in the villages seriously. At a science conference in Semipalatinsk with medical experts from the entire Soviet Union in July this year, the claims of the village residents of increased number of deaths from cancer were confirmed. The conference was held after a commission of medical experts had finished its study. The conference also took a sharp issue with the covert study at Dispensary Number Four which was categorized as "fighting against elementary principles of compassion and physicians' ethics."

KGB Chief Was the Boss

During the entire 40-year history of atom bomb testing in the area, research stamped secret was conducted on selected groups of the population. At regular intervals, the people were picked up in the villages brought for several one-month long examinations at the closed clinic, Dispensary Number Four. The clinic was built by the notorious leader of Stalin's secret police, Laventija Beria. It was only in 1954 that the secret clinic was transferred to the Health Ministry.

In the village of Sarsjal only 28 km from where the blasts are conducted, the local doctor, Nagias Zenbajeva, can tell about more than 240 persons who regularly are being examined by doctors from the dispensary. At no time has she been or is she informed about the type of examinations or the reason behind them.

"I can only state that half of the 243 persons who during the last decades have been examined by Dispensary Number Four are now dead of cancer, heart disease, or suicide."

Not Only in Karaul

In Semipalatinsk, the local doctors are also outraged with Dispensary Number Four:

"We know that they have been conducting examinations of the people who received radiation for many years. But we do not know their results," says Dr. Mayra Zhangelova.

She does not hide the fact that it is difficult and uncomfortable for her to criticize her colleagues.

"But these medically trained doctors only examine people, they don't treat them. The secret medical statistics and closed medical institutions are a criminal violation," says Shangelova.

She was brought up in the village of Karaul herself and confirms that Rakiembiev and 39 others were left behind during the hydrogen bomb explosion in 1953:

"How could that not be confirmed? They are the living witnesses."

S.B. Balmukhanov, deputy director of Alma-Ata's Institute for Oncology and Radioactivity Research and a member of the Kasakhstan Science Academy, not only confirms that people in Karaul were kept behind to experience an atomic explosion, he also states that the same thing happened in another small town, Kainar, close to the test site.

"Sixteen people in Kainar were kept back—just as in Karaul—while the rest were evacuated in connection with an atomic test explosion," says Balmukhanov.

And he knows what he is talking about. From 1953 to 1958, he checked the health condition of the people close to the test area and he was supposed to evaluate how great the dangerous effects of the atomic explosions were.

The study, which was financed by the Science Academy in Alma-Ata, was then ordered stopped by Moscow. The available results were too controversial. All his research material was taken away from him and stamped secret.

Deformed Children

Today, there are many doctors in the Semipalatinsk region who have begun to talk openly about the consequences of the testing of atomic bombs. At a children's hospital, installed in primitive barracks without warm water or sewer systems, one of the doctors tells about treating an unusually high number of children with birth defects.

"Three days ago, we had one child with congenital kidney defects and we operated on him three days after birth. He had two cancerous tumors in the kidney. Recently we had two children from the area that borders on the test site. Both had cancer of the intestines. Only one survived. We have no choice other than to operate," says the pediatrician.

The reason for the many deformities is the test site of the atomic bomb, he says.

"I have practiced medicine for 11 years. For seven years, I worked in another part of Kazakhstan. These kind of defects were very rare there but here we often encounter them. Heart defects and external deformities are quite frequent. Extra fingers and toes are very common. There is no doubt that the test site of the atomic bomb has a great effect."

Military Rejects

The Soviet Health Ministry, which is also being criticized for withholding information on radioactivity at Chernobyl, has remained silent. Letters from people used as guinea pigs, such as Talgot Slambekov, remain unanswered.

Despite numerous requests, Dispensary Number Four's Chief Physician Boris Ivanovich Gusev has not been willing to grant an interview.

The chief of the test region, Lieutenant General Ilyenko, angrily rejects the idea that any people were left behind during an atomic test.

"These are provocative and extremist statements. Nothing like that has ever been practiced. Everything was done to protect the local population from the time the first atomic explosion," says Ilyenko. He explains that only animals are used for such experiments.

But the Lieutenant General's statements are being contradicted by the Soviet press. The Soviet government paper IZVESTIA reported in October this year that a great number of soldiers were killed or wounded after a military exercise during an atomic test explosion in the Ural Mountains in 1954.

Crying Widow

Before we leave Rakiembiev, we promise to give him a copy of one of the pictures we have taken.

He never received it.

When we visit him 14 days later, his disease has overtaken him. Rakiembiev died on 26 September 1989.

His widow sits silent outside the house with a pained expression in her eyes. She looks at the picture of Rakiembiev and Slambekov. Two old men with the never ending desert in the background. One tear appears at the corner of her eye and drips quietly down her cheek.

There are still six witnesses remaining.

Thomas Heurlin is the first Western journalist to visit the until now off-limits region of Soviet atomic bomb explosions. He was there for one part of the preparations for a documentary program that will be shown on TV 2 Fak'2eren tomorrow.

Nuclear Safety Official on Feasibility of Underground Plants

904E0040Z Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Dec 89 p 2

[Interview with V. Sidorenko, first deputy chairman of Gosatomenergonadzor (State Committee for Safety in the Atomic Power Industry) by Yu. Medvedev: "Underground AES's: 'For' and 'Against'"; date and place not given]

[Text] The general public, enthusiastic about the proposal by some specialists to build underground AES's, sees this as a panacea to all the problems of nuclear power. Many are convinced that underground plants will eliminate the three main shortcomings of nuclear power. They will provide protection from external forces, sharply reduce radioactive emissions during serious accidents and simplify the entombment of decommissioned plants. Several institutes have been ordered to study the feasibility of PAES's [Underground AES's]. The first results are now being summarized. What are they? V. Sidorenko, first deputy chairman of Gosatomenergonadzor, explains.

[V. Sidorenko] First of all, it is necessary to admit that we are repeating the experience of the West. Back in the 1970's a similar study was made in the United States; underground nuclear power plants were not deemed promising. I say this in all seriousness, as Americans acquainted us with their conclusions.

What is clear and unclear today? It has become obvious that an AES in its present form cannot be put underground. It is necessary to have fundamentally new equipment, differently arranged. It will be extremely difficult to produce this equipment. It will require huge sums and a lot of time. Even if we prove that PAES's are very beneficial and safe, dozens of years will be required for their mass introduction.

Now, as to what is unclear.

Hydrogeological conditions are unfavorable for PAES's. The main difficulty is groundwater and ground movement. These may increase the negative consequences of a serious accident. What about AES personnel? Where should they be, above or under the ground? In any case the personnel will be in extremely difficult situations.

Finally, will a PAES reduce emissions during a serious accident?

Although the plant is underground, it will be linked to the surface by tunnels, passageways, steam lines and the ventilation system. Also, there will be many cables and other communications systems. The total area of all such linkages to the surface is estimated to be hundreds of square meters. During an accident, radioactivity will escape to the surface through these channels. Nobody has yet proven that it will be less than for an accident on an above ground plant.

[Yu. Medvedev] However, the station can be isolated and communications shut off.

[V. Sidorenko] Unfortunately, this is an extremely difficult task. Of course, there is equipment to close transport tunnels. One can build devices to turn off pipes taking steam to turbines on the surface. However, there are cracks, gaps and voids. Their total area is measured in square centimeters, but this small area is sufficient for radiation to come to the surface in a serious accident.

[Yu. Medvedev] When discussing accidents at an AES, most people have in mind an explosion that no containment shell could hold. However, an underground plant would be stronger.

[V. Sidorenko] This is not true. If everything were so simple, one could in principle pile up a mountain over an AES and not have to put it underground.

[Yu. Medvedev] I assert again that it is easier to decommission a PAES.

[V. Sidorenko] Today there are different viewpoints about the fate of an AES after its service life is completed. The most intelligent alternative is to reuse the equipment and the area. Also, it should be kept in mind that one cannot simply close off a PAES; its fuel rods must be removed, as they contain about 95 percent of the unspent uranium.

In principle, of course, one must study all directions. However, a basic work-up of a PAES design will cost millions of rubles. My experience shows that given the present acute situation in nuclear power, it is irrational to rush investments into underground stations. Such resources could be far more effectively used to improve safety at existing stations.

[Yu. Medvedev] Studies show that there is a very high probability that a Chernobyl-type accident can be repeated prior to the end of the century.

[V. Sidorenko] I agree, an accident can happen. But how great will the emissions be? This is the fundamental question. People are convinced that all serious accients will become like Chernobyl. This is not so.

Reactor design itself should eliminate dangerous emissions even in the most serious accident. Now the entire world is designing just such reactors. In any case, the search for improved safety is now concentrated on PAES's. There are many unutilized reserves here. For example, throughout the world, calculations of accident probability do not include a rupture of the reactor. This is considered to be a very low probability event. However, in principle, one can build a reactor roof, designed for a rupture, in the gap between the reactor and the containment shell. In other words, it is not necessary to put the reactor underground in order to strengthen the design.

However, imagine that the recommendations of specialists are accepted, AES's are shut down and we actively undertake the construction of underground plants. I am convinced that this will only be a breathing space to calm public opinion for a time. As soon as construction begins, there will be protests.

Recall what happened in Gorkiy, where it was proposed to build an atomic heat supply station. First our specialists announced: "We do not believe you; give us experts from the International Atomic Energy Agency." Foreigners arrived and concluded that the station was safe. They were not believed. Now it is said, "The station must be put underground." However, look what is happening in Semipalatinsk; there are protests against underground explosions.

[Yu. Medvedev] What do you think; is it at all possible to convince people that nuclear power is necessary?

[V. Sidorenko] At one meeting with French specialists, they said that no arguments can change the public's negative attitude towards nuclear power. This is useless. Public opinion can be moved only by life iteslf, by harsh necessity.

[Yu. Medvedev] One good winter, and everybody will be for nuclear power?

[V. Sidorenko] There is some sense to that. However, the English are opposed to this harsh formulation. They think that one must work with the public and explain things to it. I think that this is true. It is better if people make decisions with their eyes open.

[Yu. Medvedev] For many the main lesson of Chernobyl is that nuclear power is not for us. Given our standards of production, technology and production relations, we simply have not grown up enough for nuclear power plants.

[V. Sidorenko] The question, of course, is serious. But what about the chemical and biotechnology industries? Is modern agriculture dangerous because of mineral fertilizers? Should we sit and wait until somebody tells us: "OK, children, you are grown up enough for complicated technology."? In my opinion, this is humiliating.

Essentially, then, perestroyka should also cover nuclear power. The main goal of transformation is to finally begin to work well. Also, glasnost will make it possible for society to strictly control nuclear power plants.

Scientist Points Out Advantages of Breeder Reactors

904E0042Z Moscow PRAVDA in Russian 3 Jan 90 p 4

[Article by USSR Nuclear Society board member Doctor of Physio-Mathematical Sciences N. Rabotnov under the rubric "Scientists on Nuclear Power": "Those 'Fast Neutrons'"]

[Text] *USSR Academy of Sciences Corresponding Member V. Troitskiy, in the long article "Will There Be a Catastrophe on the Planet?" (PRAVDA, 15 Sep 89), justly sounds the alarm on the score of the inevitability of the depletion of mankind's fuel resources and calls for a unification of efforts to create renewable and ecologically neutral power sources. One can only share this alarm and join in with these efforts. But the author, on one point key to the issue under consideration, expresses an opinion that strongly undermines the convincingness of his concepts. The discussion concerns the prospects of fast-neutron reactors. V. Troitskiy feels it possible to dismiss them in a single brief paragraph founded on incorrect assertions.*

On the reliability of reactor control... The regulation of nuclear processes in fast-neutron reactors is simpler than for thermal ones thanks to the use of comparatively compact active zones with more homogeneous neutron fields. All operators who have worked with reactors of various types say with one voice that the fast ones operate in much more stable fashion than large thermal installations and that they are simpler and more reliable to control.

"Plutonium is used in nuclear weapons. The dissemination of AESs [nuclear power plants] using fast neutrons will create grounds for nuclear terrorism and blackmail and, possibly, the spread of nuclear weapons," writes V. Troitskiy.

Plutonium really is used in nuclear weapons. But all the plutonium used in the tens of thousands of nuclear warheads filling the nuclear arsenals of the powers was made in conventional thermal reactors. It is formed inevitably in them with an efficiency just half that of the fast ones. The fast ones, however, use plutonium as a fuel and burn it, while today's reactors only accumulate it.

"All of these specific dangerous features, along with a number of others, impelled the United States to reject the utilization of fast reactors and halt appropriations for the development and construction of the first American AES using a fast-neutron reactor as early as 1977."

The United States in no way curtailed the development of fast reactors in 1977, and has constantly allocated more funds than any other country for this purpose. They sharply altered the orientation of the technical direction of those appropriations, however, at the end of the 1970s. The USSR and France had by that time achieved the greatest successes in fast-neutron technology. The United States, evidently deciding to "pass without catching up," switched from the concept of units with high unit capacity to relatively small modular installations. The near future will show how successful they have been in achieving this, since two versions of modular fast reactors have been developed in the United States. The research sector of nuclear-power engineering in the United States overall was and remains the strongest in the world. It is enough to say that there are presently 99 research reactors there (we have 24, and an appreciable portion of those has been halted). Commercial nuclear-power engineering in the United States is triple ours and twice that of France as well—its share of national electric-power generation now comprising 18 percent—while it will reach the 20-percent level in 1990-91 with 124 (!) operating power units with an overall capacity surpassing 100 gigawatts. The 8-percent figure cited by V. Troitskiy is a clear error.

V. Troitskiy, in commentary by the science department of PRAVDA, is justly described as a prestigious and competent scientist. He is a very major radiophysicist and the creator of our first radio telescopes, and is presently a major expert on extraterrestrial civilizations. His assertions regarding nuclear-power engineering, however, show that he was unable to resist the temptation to make sharp and categorical statements on an issue that has been very important and very acute here since the Chernobyl tragedy, knowing it, to all appearances, just by hearsay.

The possibility of breeding is the chief and unique property of fast neutrons. Other of their merits, associated first and foremost with problems of safety, are taking on more and more significance under today's conditions. They use a liquid-metal coolant. High pressure is not needed in either the primary or secondary (intermediate) circuits therein. It is just one and a half atmospheres in the reactor circuit—less than in a bicycle tire (the pressure is on the order of hundreds of atmospheres in thermal reactors with water or gas cooling). It is clear that this effectively reduces the probability of serious physical damage to pipelines and the vessel to zero. Not a single one of these coolants contains radioactivity in the heat exchange between the sodium of the secondary circuit and the water vapor turning the turbine, while the heat exchangers are insulated from the

reactor itself. All preventive maintenance and repair operations can be performed on them using conventional means.

Furthermore, although this could seem paradoxical according to recollections of high school chemistry lessons, the corrosive compatibility of structural elements with liquid sodium is much higher than with water, as both steel and sodium are metals and are mutually chemically neutral.

The importance of yet another aspect of the physics of fast-neutron reactors is becoming more and more clear. The discussion concerns handling the radioactive wastes of the nuclear-fuel cycle. The necessity of their safe burial for super-long-time periods—on the order of tens or even hundreds of thousands of years—is associated with an especially dangerous component of these wastes—the very heavy isotopes and transactinides that have undergone alpha decay and spontaneous fission with very long half-lives. Large-scale national nuclear-power engineering produces a few hundred kilograms a year of these isotopes in all, but it is namely they that require "geological" time periods of burial.

These isotopes are efficiently burned up in the stream of fast neutrons in repeated utilization as secondary nuclear fuel in fast reactors. Recent calculations performed by American specialists show that the level of residual radioactivity obtained in the waste storage areas of thermal reactors after millions of years is reached in just two hundred years with the optimal organization of the nuclear-fuel cycle using fast-neutron reactors. This effectively removes the acuity of the problem.

After Chernobyl many justly feel that a continuation of the large-scale utilization of nuclear power should in any case be conditioned by the development of new and safer types of reactors. But fast reactors with sodium coolant, as well as the thermal reactors that were developed for ASTs [nuclear heating-supply plants], are themselves representatives of a new generation of enhanced-safety equipment. They take into account many years of experience in the development of domestic and worldwide reactor building.

While reasonably pointing out the lofty achievements of Western flame-based power engineering in the development of environmental-protection measures and our lag in that realm, V. Troitskiy does not mention the principal reason for the decision to build AESs instead of TESs [thermal-electric power plants] in the European part of the USSR. That was the crisis-level, critical strain on coal-transport systems. It has to ship hundreds of millions of tons distances of thousands of kilometers. Whence the largely close-to-paralyzed state into which various stretches of our rail network, overloaded beyond all measure, fall all the time.

Critics of the current state of our industry are correct: the escalating spiral of the construction of power-intensive types of production and gigantic power-producing facilities must be slowed. We must reduce the number of gigantic long-term construction projects and direct the funds freed up thereby into the housing, road-construction and social and cultural spheres. But not everyone is taking into account the fact this process has already begun in spur-of-the-moment fashion, and namely in power engineering. The cancellation, stoppage or slowdown of construction of a multitude of AESs, ATETss [nuclear heat and electric power plants] and ASTs, as well as GESs [hydroelectric power plants] and TESs, has already led to the appearance of a "split" between the production and consumption of heat and electric power. They are moving apart slowly, but this process cannot be stopped quickly and turned around when the consequences take on the nature of an acute national energy crisis.

Some journalists readily use the phrase "the free energy of the sun and the wind." V. Troitskiy, of course, does not repeat that. But nowhere does he indicate even approximately where the attempts to make use of that "free" energy are headed today, limiting himself to the valid assertion that the figures relating to the experimental installations are not very instructive. They say a great deal nonetheless. The cost of a kilowatt-hour generated by the largest solar-power plant in the world, the Crimean Solar-Power Plant, is 26 rubles. The wholesale price at our commercial electric-power plants, including nuclear ones, is 1.2 kopecks. A difference of more than two thousand times (!). That is still a true chasm. We cannot talk of any practical utilization of such technologies. And no ray of hope can be seen, despite very intensive and dogged research in many countries.

The funds allocated for these purposes, of course, are not comparable with the spending on flame-based and nuclear-power engineering, but only because there is simply nowhere to invest them. Such countries as Japan would pay dearly for a safe, ecologically clean and renewable source of energy. However, notwithstanding the exceptional receptiveness of the Japanese technology and economy to everything new, nothing even remotely like wind-power generators or solar batteries that are market-competitive on the scale of national power engineering are on the long list of Japanese technical marvels.

Japanese nuclear-power engineering, however, is developing rapidly. This is all the more instructive since, 15-20 years ago, there was no nation in the world with stronger antinuclear sentiments than the Japanese, who had experienced the horrors of Hiroshima and Nagasaki. But common sense prevailed. The largest AES in the world, the Fukushima (10 power units with a total capacity of 9 million kilowatts) is located in a heavenly lush valley on the shore, and there is not even a railroad spur to it. A tractor trailer arrives on occasion with fuel—and that's it. And if it were replaced with a coal-fired TES? What the combustion of such a quantity of fuel in one place would lead to can be understood from the example of Ekibastuz...

France is a leader in the development of nuclear-power engineering, and they are talking about closing the last of

the coal- and fuel-oil-fired TESs there as a real possibility. That has allowed the French Secretary of State of the Environment, B. Lalonde, to announce the impending transformation of France "into the ecological showcase of Europe."

The word "radiation" almost never appears in our periodicals without the adjectives "deadly" or "destructive." They forget, and many evidently do not suspect, that ionizing radiation is the weakest of all types of accidental exposure on the organism. The intensity of that exposure is not at all comparable with the shock wave of an explosion, the flash-flame of a fire, the physical blow of a traffic accident or a strong poison. Even at Chernobyl—and that is the sole radiation accident in domestic or world peaceful nuclear-power engineering with human fatalities in all of history—only those who were located right in the very thick of it for several hours, performing their duty in heroic fashion, perished from radiation.

Chernobyl changed much in our views. Today we can establish only material losses with sufficient certainty. Enormous expenditures have been underway up to now, and society should know about them. The thirty people who perished from the fatal impact dosages, of course, are not all of the victims. Statistics on the unprecedented volume of medical operations connected with the creation and functioning of the All-Union Register should be published in substantially more completeness and detail than has been done thus far. Only then can the assurances of the physicians of the absence of any observations of negative shifts of morbidity and mortality over a three-year period stand a chance of being convincing. We cannot talk out of the sides of our mouths on this. PRAVDA has done a great deal to disseminate objective information about the consequences of Chernobyl, but it can and should do even more. A truly serious discussion of the strategic prospects for nuclear-power engineering is impossible without it. There is still a great surplus of emotions and rumors.

Energy conservation is a large reserve, but the efficient incorporation of effective measures in this realm that was implemented by the Western countries in the 1970s requires a technical level that we do not now possess in the majority of the realms of the economy. And the calls for energy economy are not achieving anything. The difficult, prolonged and expensive cause of incorporating energy- and resource-conserving technologies must begin immediately, but we cannot expect any "Great Leap Forward" here. We are not economizing energy because we do not know how to, not because we do not want to. And the teaching of that art cannot proceed appreciably faster than the teaching of all the other knowledge essential in the modern world.

And in conclusion I repeat: no one knows when the much-exalted bird in the bush of solar and wind power will emerge, but the much-cursed bird in hand of nuclear power, with the aid of fast reactors, can provide mankind with heat and light for the next millenium. This is clear even today to all those who know the real state of things.

EUROPEAN AFFAIRS

FRG, GDR Discuss Reactor Safety Research

AU1601094690 Frankfurt/Main FRANKFURTER ALLGEMEINE in German 16 [illegible] 90 p 4

[Report by K.B.]

[Text] Bonn, 15 Jan—Before Environment Minister Toepfer's talks in the GDR this week about the safety of nuclear energy facilities, Research Minister Riesenhuber announced that joint reactor safety research has already started. Reactor Safety research was agreed in the 1987 intra-German government agreement on science and technology. Riesenhuber pointed out that questions of reactor safety have to be discussed in all their comprehensiveness, from emergency cooling to the risk of emission of fissionable material. Some topics for work have already been set down. It has also been decided to include the Soviet Union in the cooperation between the FRG and the GDR, so that there is sufficient knowledge about the Soviet rectors for the GDR. This cooperation between the experts from three countries started in April 1989.

FEDERAL REPUBLIC OF GERMANY

Nuclear Transport Safety Said Compromised

Transport Laxity Scored

AU1501164990 Hamburg DER SPIEGEL in German 15 Jan 90 pp 68-72

[Text] The Federal Economic Office in Eschborn, Hessen, which is responsible for monitoring import and export laws, is known for its generosity toward entrepreneurs. However, over the past months officials repeatedly felt compelled to dial the number of the nuclear inspectors of Bonn's Environment Minister Klaus Toepfer (Christian Democratic Union), because they were enraged about one of their clients.

They had noticed, the normally so generous Eschborn officials complained, that the Nuclear Cargo and Service (NCS) Company displays a remarkable laxity in the transportation of nuclear fuel and radioactive waste. In spot checks they found that the actually transported amounts of hazardous material deviated impermissibly from the information contained in the export and import papers—"sometimes upward, sometimes downward."

Toepfer's inspectors reacted with shock. After all, the NCS is not transporting coal or steel, but highly dangerous nuclear materials from the nuclear fuel cycle.

In addition, the company is not some dubious small company, but a 100-percent subsidiary of the state-owned Federal Railroads (DB). For weeks the reactor safety officials have been wondering whether a fine is still an appropriate reaction, or whether the permit for the transportation of radioactive materials should be rescinded. So far, an urgent ministry request for information addressed to the heads of the railroads has not been answered.

Toepfer will hardly be able to get out of the affair by simply issuing a reproach. The issue has long been more than just sloppy dealing with paperwork: The NCS has repeatedly ignored regulations, they are transporting loads without permits, and they transport radioactive waste by road, even if the less dangerous railroads can be used.

The decision is not a matter of routine for Toepfer: Rescinding the permit for the transportation of nuclear material would not only mean the end for the NCS, but would also finally discredit the environment minister's much praised new regulation of the nuclear industry. Three years ago the minister himself brought the NCS into business, when he had to deal with an unprecedented scandal—the affair surrounding the Hanau nuclear transport company Transnuklear (TN).

In order to get orders for transportation and disposal from FRG nuclear power plants, TN managers generously put money into illicit accounts and violated laws. With bribes and gifts to the tune of millions, the TN staff encouraged business partners to give them orders, and nuclear waste was transported right through Europe with forged papers.

The upper crust of the German nuclear industry was directly or indirectly involved in Transnuklear, from the Rhine-Westphalian Electricity Works (RWE) to Degussa to Siemens. The unclear interlacing of interests, Topefer said at that time, gave rise to a "gold-digger mood" in this sector, which favored many plots.

Because of the "criminal energy" (Toepfer) of TN personnel, many West Germans got the impression that the sensitive nuclear sector, which praised itself for the utmost conscientiousness, was in reality ruled by mafia bosses. After the bribery by Transnuklear had been brought to court, Toepfer had to act.

With the help of Deutsche Bank, the Christian Democrat forced a new order in the sector, which was intended to prevent conflicts of interests and to favor mutual control: The production of fuel rods, which had so far been under the influence of electricity producers, went to Siemens. The sacked electricity works had to accept—via the joint subsidiary GNS (Gesellschaft fuer Nuklear-Service)—responsibility for the processing of all nuclear waste, which so far had been a domain of Transnuklear.

Toepfer did not want to leave the most sensitive area, that is, transportation of nuclear material, to private striving for profits: In the future, this should be done by the Federal Railroads—nobody thought of the subsidiary NCS at that time—via the rails, loyal to the laws, and under state control.

However, what happens in practice is totally different. In January last year, for instance, a transport container for

fuel rods, which was contaminated by radiation on the inside, rolled from southern Sweden through Europe to Grenoble in southern France—not on the rails, but on the loading area of an NCS truck.

For such a load the transportation company needs a special permit, in line with article eight of the radiation protection regulation, as well as a million-Deutsche mark insurance. This was too bothersome to NCS, the company transported the empty type TN 7 container—registration number D-4213-B(U)—to the ILL nuclear research institute in Grenoble without a permit.

There the container was needed for a special purpose: NCS had snatched from a lot of competitors the order to take the burned-out fuel rods, which can be used for the construction of nuclear bombs because of their high uranium content, to the United States.

The original NCS plan was that the cargo should be taken on FRG roads to a Netherlands port and should be shipped to the United States from there. Unofficially, NCS representatives asked the authority that issued permits, the Federal Physical-Technical Institute in Braunschweig, whether the tour would be authorized. There the responsible expert, Professor Friedrich-Wilhelm Collin, immediately said no: The "permit" was missing.

At that time the NCS was still being checked for reliability, which was ordered by the nuclear law; therefore, the company was not permitted to transport any nuclear fuel at all. This applies not only to the FRG: In European practice, a carrier authorized in one country is permitted to operate in other EC countries without any further procedures. On the other hand, someone who has been barred from transportation for a specific period or forever in his homeland, is not permitted to operate abroad, either.

However, the company did not let itself be prevented from working. After two weeks of haggling, Thomas Schmidt and Werner Geiger, two NCS managers who had come specially for this purpose and had both worked for Transnuklear in the past, presented a certificate from the state monopoly company Electricite de France, and the load was transported by road to the Atlantic port of Cherbourg.

Ekkehardt Bauer, technical chief of the Grenoble reactor, remembers: "The shipment went surprisingly well, but I know that there were delays and that French bodies were asked for help."

After that, in possession of the necessary permits, the Federal Railroads subsidiary NCS developed a strange preference for road transportation. Thus, the first official load of fuel rods from Hessen to Geesthacht in northern Germany was transported on the highway. The railroads subsidiary forgot to inform the laender which had to be crossed about the radioactive cargo in advance. The NCS management was promptly "summoned" to the FRG environment minister.

There was no effect: Radioactive construction waste from the tearing down of the Bavarian nuclear power plant Niederaichbach, for instance, is taken by NCS on trucks to the Karlsruhe nuclear research center, even though the sender and the addressee have fully completed rail links.

The railroads also left to the NCS trucks the transportation of "lost concrete shielding"—these are concrete barrels with radioactive waste—from the Baden-Wuerttemberg nuclear power plant in Phlippsburg to the intermediate storage site in Gorleben in Lower Saxony. So far, four loads have been transported by road, the latest one shortly before Christmas.

The railroads also dictated the more expensive solution to the energy producers—and thus to the electricity customers. The railroads had made an offer of DM8,000 per load, including profits, for transportation from Philippsburg. The road transporters got the commission—through internal railroads channels—for DM10,000 per load.

This inclination toward the roads has already caused astonishment in Bonn's Environment Ministry. In addition, the inspectors complained that medium- and low-level radioactive nuclear waste from the German laender is not transported by railroad but by truck, even to remote Sweden, even though Toepfer's concept prescribes the less hazardous rail transport whenever possible.

The strange trend toward roads by the Federal Railroads subsidiary can be explained by economic reasons. When the Federal Railroads suddenly had to take over all nuclear transportation in the FRG, DB chief Reiner Gohlke reacted with restraint. Even though his people had some experience in this business, he obviously did not think that they would be able to handle the technically and bureaucratically complicated shipments in large numbers. At that time, however, the transportation department of the scandalous company Transnuklear had the know-how. Its department head, Rolf Schueler, and his team had emerged from the affair relatively well; they offered their services to the state company.

Schueler acted so convincingly that the Treuarbeit auditing company recommended that the railroads to take over Transnuklear. For about DM8 million the company, with 58 men and an extensive car pool, went to the state company. Today, branch insiders are still laughing about the methods of assessment of Treuarbeit; they claim that the Federal Railroads were taken in and paid far too much.

Naturally, this assessment is not shared by Schueler. In DEUTSCHE VERKEHRSZEITUNG, he said that the reason for the dominant role of former Transnuklear in nuclear transportation is "that we have worked extremely reliably in the sector of nuclear transportation for many years and decades, and we have gained unique technical knowledge."

To prove that he and his people were worth their price, Schueler not only had to land orders. He also saw himself compelled to prove that through these orders he was also able to pay the amortization of the trucks, which had also been bought. Turning around Toepfer's concept, he was, therefore, interested in putting as many shipments as possible on the roads, often with very meager justification.

Strange: Schueler and company are now working in Hanau under the roof of the Federal Railroads, in the same offices and with the same telephone number and with the same vehicles as under the Transnuklear label in the past. Already in the past, critics considered the methods of the former TN and current NCS managers to be improper.

Schueler and his team got off clean—bribing private persons, even if they work in nuclear power plants, is not punishable by law. Tax investigators and public prosecutors consider this a "useful expenditure" to get orders—morally shady, but juridically irrelevant.

The files of the public prosecutor's office show without doubt that Schueler and his leading team were greatly involved in the dubious practice of bribery. Hans Guenther Knackstedt, a former leading TN employee, for instance, told the public prosecutor's office that Schueler was one of those managers who received the improper requests for bribes; Schueler then approved the "procurement" of the means needed for bribes.

In addition, Knackstedt gave the names of former and current members of Schueler's team; they were "well-known orderers" of gifts for bribes and knew everything about the system of bribery. According to the findings of the public prosecutor's office, other former TN employees, who are now in the upper echelon of NCS, were considered "specialists for the procurement of expensive electrical appliances" and people organizing "exquisite parties" for clients, including services by ladies.

During his interrogation, Knackstedt accused his ex-chief Schueler of "also having personally profited" from the practices at Transnuklear: "Mr Schueler has a shop selling Spanish leather goods. In his department Spanish leather goods were then distributed later as special Christmas presents"—to clients, of course.

However, in this respect Knackstedt did his ex-boss Schueler wrong. The shop in Gelnhausen, Hessen, where TN placed its orders, did not belong to the nuclear transport man but to his wife Verena. In the meantime, she no longer has the shop. She left it to the parents-in-law of a certain Werner Pfeifer—the man was one of Schueler's confidants at Transnuklear, and he still does this at NCS.

The pressure on the former TN transporters and current Federal Railroads contractors to avoid ingrained practices is obviously not too strong after the change in companies. The railroads appointed Klaus Putz as inspector; his duties explicitly include "the supervision of the observance of traffic regulations" and "ensuring the priority of the rails," as an internal description of his duties says.

However, the man in this office is obviously not an ideal choice. "As a result of this work so far and the result of his introductory talk, he seems to be suitable only to a certain degree," states a note made by the railroads on 15 June 1989. Due to a lack of appropriate applicants, however, there was no obstacle to his becoming Schueler's inspector.

Environment Minister Klaus Toepfer himself had scruples about the plan to put the leading team of the TN transportation department, who have a previous record, under the care of the Federal Railroads and to honor the staff by granting a permit for nuclear transportation: The minister ordered the Treuarbeit Auditing Company to draw up an expert opinion.

The assessment of the investigators was very formal: If an enterprise is sold, the new owner, that is, the Federal Railroads, has to take over the old staff, as long as there are no criminal accusations.

This assessment seems to be rather naive. Because the "necessary reliability" of managers in the nuclear sector—states the standard commentary on the German nuclear law by Heinz Haedrich—is "to be judged by applying strict standards." The loose criminal law is probably not sufficient in this connection.

This assessment is also shared by Transnuklear investigator Albert Farwick, the senior public prosecutor in Hanau: "I am surprised," Farwick says, "that decisions involving nuclear law are so closely linked with successes achieved in criminal investigations."

'Irregularities' Admitted

AU1501173590 Hamburg DIE WELT in German 15 Jan 90 p 4

[Text] Bonn—According to the Bonn Environment Ministry, "irregularities" have occurred in the transport of radioactive material by the railroads subsidiary Nuclear Cargo Services (NCS). Thus, the ministry spokeswoman, Marlene Muehe, has partly confirmed reports published by the news magazine DER SPIEGEL. In its most recent edition, the magazine reports that, quite frequently, the railroads had nuclear material transported without the necessary permits and with false details of the quantity. The spokesmen of the railroads who were on duty during the weekend [13-14 January] did not comment on the accusations.

The Environment Ministry spokeswoman did not comment on the magazine's report that Minister Klaus Toepfer wants to withdraw the license for nuclear transportation from the railroads subsidiary. The railroads were given the order to handle the transportation of nuclear material in the FRG about two years ago.

FRANCE

Nuclear Plant To Stop Making Plutonium

90ES0284Z Paris LIBERATION in French 28 Nov 89 p 15

[Article by Helene Crie: "Superphenix Reverses Its Engines"]

[Text] By 1996, the nuclear power plant known as Superphenix will practically be producing no more plutonium. Rather, it will only regenerate the plutonium it uses to operate. The European NERSA, made up of the EDF (51 percent), ENEL (its Italian equivalent, 33 percent), and SBK (a West German, Belgian, Dutch, and English consortium, 16 percent), made the decision 2 months ago "not to update the fuel production line."

The halt in plutonium production, the raison d'etre of a breeder reactor, was announced yesterday and will take affect in 1993 at the time of the first replacement of the reactor core. When the complete replacement takes place in 1996, "the reactor will no longer be anything more than a small breeder reactor," NERSA says. "This decision was made for purely economic reasons."

The clarification is important given the many technical problems experienced by the Superphenix since startup in 1985. Beyond the ecological complaint relating to safety, the EDF has always had difficulty economically justifying the existence of the breeder reactor, prototype of a line that no longer has any future in Europe since the price of nuclear fuel has dropped. Plutonium produced at Creys-Malville is all the more expensive because Superphenix repairs and improvements have swallowed up nearly 500 million francs since 1987. The plant in The Hague already has great difficulty marketing its plutonium, extracted by recycling used fuel from French light-water plants (REP). Beside the fact that it is becoming perfectly useless, "the price of plutonium produced by Superphenix would be higher" than that produced in The Hague, says Adrien Merguy, NERSA board chairman.

Superphenix will continue to produce electricity, nothing more, but ecologists will continue to protest its activity. In case of accident, the increase in power of this type of fast neutron reactor is greater than that of an ordinary thermal reactor, and the amount of plutonium that might potentially be released is substantial.

END OF FICHE

DATE FILMED

1 MARCH 1990